

DEER LODGE COUNTY, MONTANA

HAZARD MITIGATION PLAN

June 2005



February 1986 Flooding. *Photo Courtesy of The Anaconda Leader*

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Deer Lodge County Hazard Mitigation Plan

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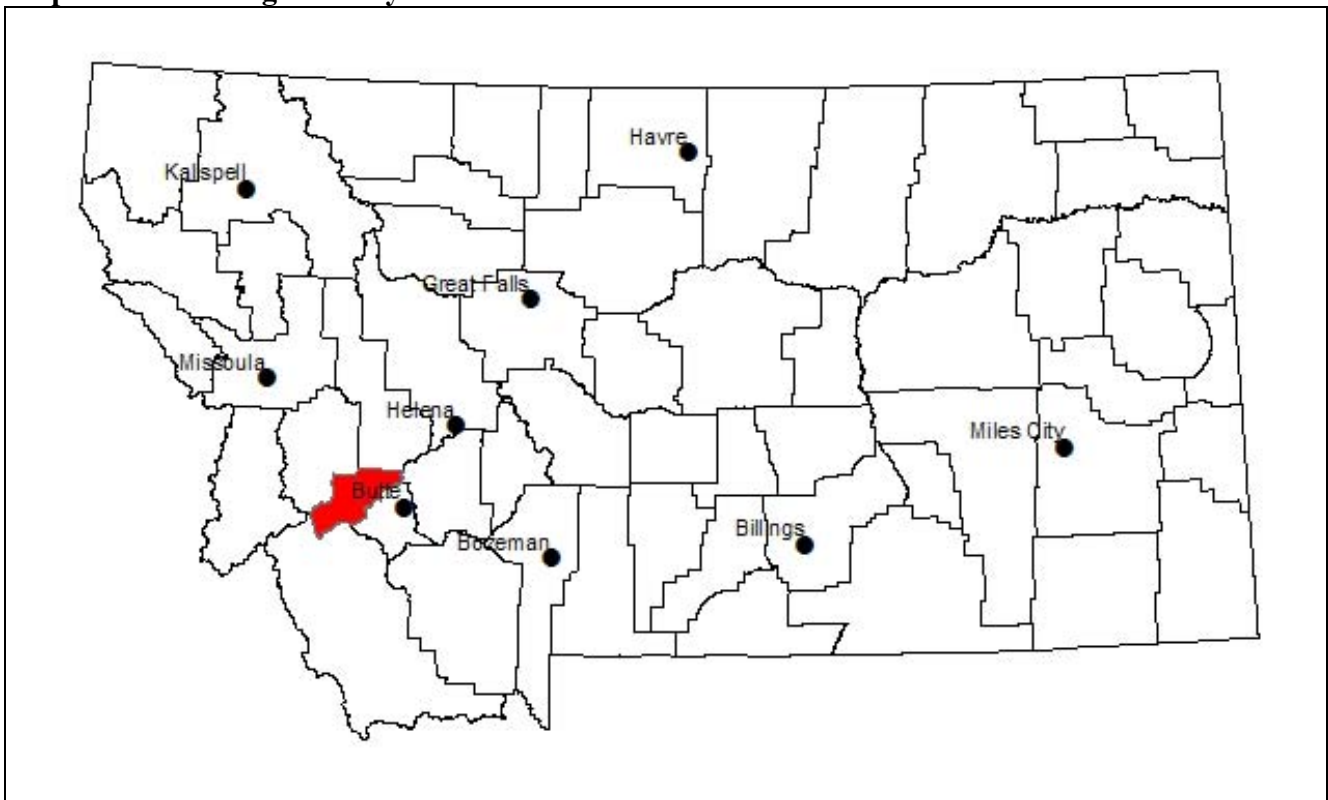
1. Adoption Documentation

2. Introduction

Deer Lodge County, Montana is taking the steps necessary to become a disaster resistant community, and through their initiative, are writing a plan to meet the requirements of the Interim Final Rule published in the Federal Register on February 26, 2002 at 44 CFR Part 201 as part of the Disaster Mitigation Act of 2000. The planning document was funded by Montana Disaster and Emergency Services and Anaconda-Deer Lodge County. The plan's intent is to assist the community in making financial decisions for mitigation projects and clarify actions that could be taken through additional funding. Hopefully through the planning process, the community has become more aware of its hazards and will continue to take a proactive approach to disaster prevention.

Deer Lodge County is located in Western Montana as shown in Map 2.1. According to the 2000 US Census data, Deer Lodge County has a population of 9,069 and an area of 737 square miles, the second smallest by area in Montana. Deer Lodge County is governed by a consolidated form of city and county government run by a Chief Executive and Commission. This governmental body is named Anaconda-Deer Lodge County and provides all city and county services. Anaconda is the largest community in Deer Lodge County with several smaller communities such as Opportunity, Warm Springs, Galen, and Georgetown. All of these communities fall within the jurisdiction of Anaconda-Deer Lodge County. The largest exception being the Montana State Hospital facilities primarily located in Warm Springs.

Map 2.1 Deer Lodge County's Location within Montana



Proudly known as the “Gateway to the Pintlers,” Anaconda is situated close to Interstate 90 and the Pintler Scenic Route. Both passing through Deer Lodge County, residents enjoy the convenience of traveling to nearby Butte while remaining within close proximity to beautiful mountain areas. The

Continental Divide passes just south of Anaconda and mountains such as Mt. Haggin tower over the area at over 10,000 feet. Deer Lodge County is surrounded by several mountain ranges: the Anaconda Range to the west, the Flint Creek Range to the north, and the Pioneer Mountains to the south. The mountainous Georgetown Lake recreational area is situated in the extreme northwest section of the county.

State and Federal public lands account for approximately 51 percent of the total land area of the county. Federal land holdings include portions of the Beaverhead-Deerlodge National Forest managed by the US Forest Service. State-owned land consists primarily of the Mount Haggin Wildlife Management Area and Lost Creek State Park. Anaconda-Deer Lodge County owns approximately 4,832 acres.¹

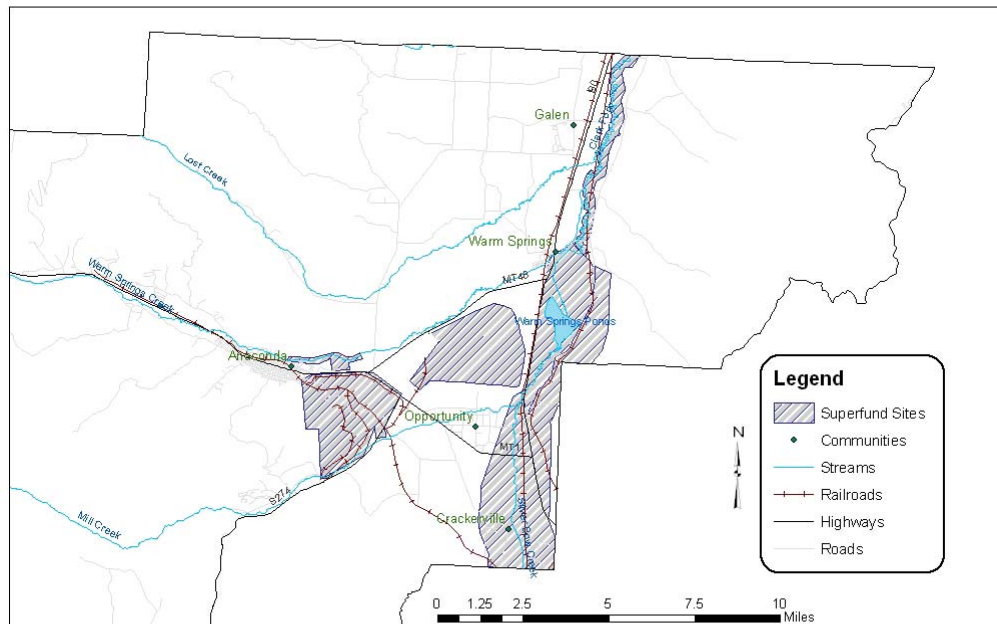
Founded in 1883, Anaconda was once a prominent mining community in Montana. In fact, the community was originally called Copperopolis for its abundance of copper smelting. The copper mining industry in Anaconda boomed starting in the late 1890's under the direction of the Anaconda Copper Mining Company, the largest producer of copper in the world soon thereafter. Anaconda was a vibrant community with a population of over 18,000. In 1980, copper operations were closed down and since then, the Anaconda area has suffered an economic downturn. The community lost 66% of its tax base and 25% of its jobs. In addition to the loss of jobs, the nearly 100 years of smelting copper ore created a waste slag pile (much like sand but harder) estimated at 300,000,000 tons now located on the outskirts of Anaconda. Despite the economic hardships related to the smelter shutdown, the community has rebounded and stabilized somewhat with residents expressing pride for the community they live in. With all of this history, Anaconda has three districts included on the National Register of Historic Places: the West Side, Commercial, and Goosetown Historic Districts.

The mining operations led to air, water, and soil contamination problems from over twenty heavy metal contaminants, and the smelter area was designated a Superfund site in 1983. The Environmental Protection Agency (EPA) is actively working in the area to remediate the contamination. From 1986 through 1988, about 250 people in the Mill Creek area were relocated. In addition, clean ups of many other sites in and around Anaconda have occurred. To date, the clean up has cost over \$4 million and many projects are still ongoing. A map of the Superfund sites can be found on Map 2.2.

¹ Anaconda-Deer Lodge County Capital Improvements Plan, July 2002.

Map 2.2

Deer Lodge County, Montana Superfund Sites



Data Source: Environmental Protection Agency CERCLIS Sites from Montana Natural Resource Information System

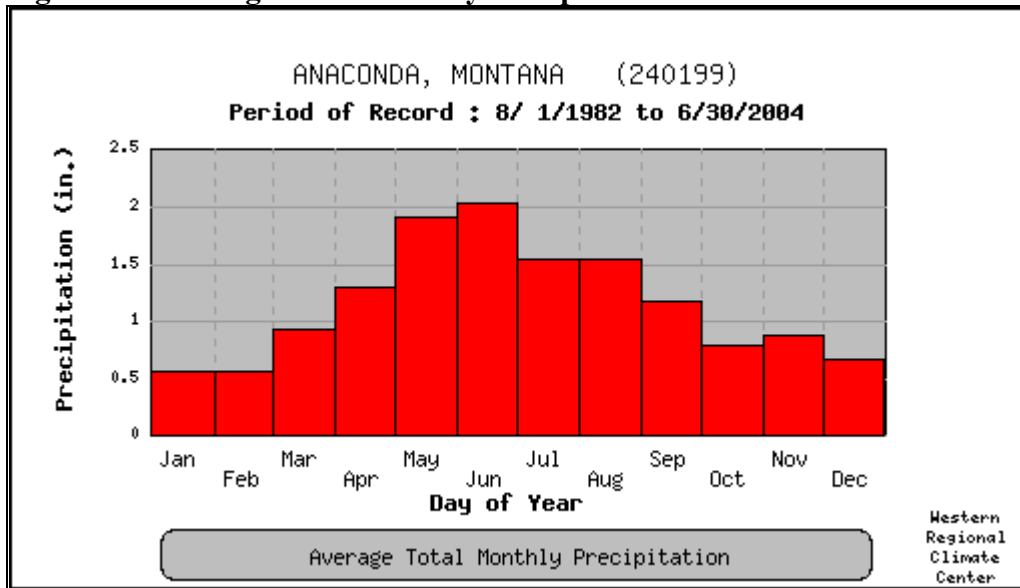
The climate of Deer Lodge County is typical of most Montana areas with warm, dry summers and cold, snowy winters. Table 2.3 shows data from two stations in Deer Lodge County – Anaconda with data recorded since August 1, 1982 and East Anaconda recording from September 1, 1905 through July 31, 1980. Figure 2.4 shows when the precipitation typically falls during the year.

Table 2.3 Deer Lodge County Weather Statistics²

	Anaconda 1982-2004	East Anaconda 1905-1980
Minimum Temperature	-38°F	-35°F
Maximum Temperature	100°F	100°F
Average # of Days Dropping Below Freezing	202 days	179 days
Average # of Days Staying Below Freezing	36 days	59 days
Average Precipitation (liquid equivalent)	14 inches	14 inches
Lowest Annual Precipitation	9 inches	7 inches
Highest Annual Precipitation	21 inches	22 inches
Average Snowfall	73 inches	59 inches
Highest Annual Snowfall	126 inches	130 inches
Highest Daily Snowfall	18 inches	18 inches

² Western Regional Climate Center, October 2004. <http://www.wrcc.dri.edu/>

Figure 2.4 Average Total Monthly Precipitation for Anaconda²



Deer Lodge County is prone to many types of weather related hazards including winter storms, extended cold, wind, severe thunderstorms, tornadoes, drought, and flooding.

The geology of Deer Lodge County also puts the area at risk for geological hazards. Earthquakes have been known to shake the region periodically and the mountainous slopes throughout the County present avalanche and landslide hazards. With much of the County covered by forest, compounded by the typical arid climate, wildfires are also a frequent problem. The volcanic areas of the Cascade Range to the west and the Yellowstone Caldera to the southeast pose the ever present possibility of ashfall on Deer Lodge County.

Given the urban nature of Anaconda and the surrounding areas, manmade hazards also exist in Deer Lodge County. US Interstate 90, active railways, an airport, and fixed facilities put the County at risk for hazardous material releases and aviation incidents. Urban fires, communicable disease, bioterrorism, dam failure, terrorism, utility and communications failure, and civil disorders also have the potential to affect the communities.

Despite these hazards, Anaconda-Deer Lodge County hopes this plan identifies those hazards that greatest threaten the community and develop solutions to mitigate future damages. Additional hazards may exist that are not apparent to the local government or residents, and certainly hazards can occur in unexpected ways. Although any and all hazards cannot be fully mitigated, hopefully, this plan will help the community understand the hazards better and become more disaster resistant.

3. Planning Process

The planning process used in developing this Hazard Mitigation Plan attempted to maximize community input and utilize a wide variety of informational resources. The planning process began in February 2004 with an advertised public meeting that was held in conjunction with the Local Emergency Planning Committee (LEPC) meeting. This group consists of representatives from emergency management, fire services, medical and health services, public health, State and Federal government, search and rescue, law enforcement, road maintenance, utility companies, private businesses, planning, education, Red Cross, and the public. This already active committee was determined to be an excellent core group because of its broad representation. Attendance records can be found in Appendix B.

The first public meeting was advertised through a public notice in The Anaconda Leader newspaper. This meeting introduced the attendees to the reasons for mitigation planning and hazard analysis and the scope of the plan. Attendees then identified the hazards and prioritized them based on their initial concerns. Newspaper records can be found in Appendix A.

The second public meeting was held in May 2004. This meeting focused on reviewing historical hazard information and identifying critical facilities. An extensive discussion of each hazard's history was conducted with the knowledgeable attendees, including a resident meteorologist and long-time residents. Attendees also reviewed the preliminary critical facilities list.

The third public meeting was held in October 2004. At this meeting, attendees were presented mapping of the hazard areas and were prompted to think about possible mitigation activities. The identified critical facilities were located on a map for comparison with the hazard mapping.

At the fourth and fifth public meetings in November 2004 and April 2005, a summary of the risk assessment was presented with potential losses emphasized. Attendees decided on mitigation goals, objectives, and potential actions. The mitigation strategy was developed as a result of these meetings.

A final public meeting was held in May 2005. Comments were invited on the draft plan. Several items were discussed, agreed upon, and incorporated into this final plan document. The draft plan was available at the Hearst Free Library, and the Big Sky Hazard Management LLC website also displayed the plan beginning on May 16, 2005 and provided an e-mail address and telephone number for comments. The comment period continued until June 2, 2005, and those comments received were also incorporated into the plan where appropriate.

Future updates of this plan will continue to use public input as described in the *Plan Maintenance Procedures* section.

4. Risk Assessment

The all hazard risk assessment serves as a single, consolidated source for hazard information in Deer Lodge County. Other plans may be referenced and remain vital hazard documents, but each hazard has its own profile in this plan. As more data becomes available and disasters occur, the individual hazard profiles can be expanded or new hazards can be added. This summary of hazards identifies and describes the hazards that threaten Deer Lodge County and determines the values at risk from those hazards. The risk assessment is the cornerstone of the mitigation strategy and provides the basis for many of the proposed actions.

Hazard Identification

Deer Lodge County is exposed to many hazards. The hazards were identified and profiled through several different means. Hazards were initially identified by participants in the first public meeting. Participants included government, the private sector, and the public. Then, a history of past events was gathered and possible future events were recognized through internet research, available GIS data, additional public meetings, subject matter experts, and an examination of existing plans.

The hazards (in alphabetical order) have been identified as follows in Table 4.1. The level of detail for each hazard is based on the relative risk of each hazard to the community and is limited by the amount of data available.

Table 4.1 Hazards Identified in Deer Lodge County, Montana

Hazard	How Identified	Why Identified
Avalanche	<ul style="list-style-type: none">• State DES Website• Historical records from the Avalanche.org database• Colorado Avalanche Information Center• Montana Hazard/Vulnerability Analysis, 1989• Public meeting input	<ul style="list-style-type: none">• Mountainous terrain exists that may be prone to avalanches• Avalanches have occurred in Deer Lodge County
Aviation	<ul style="list-style-type: none">• Research of NTSB database• Public meeting input	<ul style="list-style-type: none">• The county has one airport• History of incidents, some with casualties
Communicable Disease and Bioterrorism	<ul style="list-style-type: none">• Centers for Disease Control and Prevention website• Public meeting input	<ul style="list-style-type: none">• Large number of livestock areas• History of a significant influenza outbreak during the 1910's• Rapid disease spread potential through urban areas

Table 4.1 (continued) Hazards Identified in Deer Lodge County, Montana

Hazard	How Identified	Why Identified
Drought	<ul style="list-style-type: none"> • Montana Drought Advisory Committee website • National Drought Mitigation Center website • Data from the Western Regional Climate Center • State DES website • NOAA Paleoclimatology Program website • Public meeting input 	<ul style="list-style-type: none"> • Frequent historical drought events • USDA Disaster Declarations • Relationship to wildfire danger • Impact to agricultural community • Impact on natural resources and tourism
Earthquake	<ul style="list-style-type: none"> • Montana Bureau of Mines and Geology publication and website • USGS National Seismic Hazard Mapping Project website • University of Utah Seismograph Stations website • USGS National Earthquake Information Center website 	<ul style="list-style-type: none"> • History of nearby earthquakes greater than 6.0 magnitude • Proximity to the Intermountain Seismic Belt and Centennial Tectonic Belt • Potential for large losses
Flooding - Dam Failure	<ul style="list-style-type: none"> • National Inventory of Dams website • Dam Emergency Action Plans 	<ul style="list-style-type: none"> • Five high hazard dams and one significant hazard dam exist in the county
Flooding – Riverine and Flash	<ul style="list-style-type: none"> • FEMA Flood Insurance Study and Rate Maps • Anaconda-Deer Lodge Historical Records 	<ul style="list-style-type: none"> • Extensive history of significant flooding • Four Presidential declared disasters since 1974
Hazardous Materials	<ul style="list-style-type: none"> • Anaconda-Deer Lodge Hazardous Material Plan • Public meeting input 	<ul style="list-style-type: none"> • Fixed facilities exist in the county that house hazardous materials • Regular interstate, highway, and railroad traffic transport hazardous materials
Landslide and Ground/Soil Failure	<ul style="list-style-type: none"> • USGS National Landslide Study • Montana Department of Transportation District 2 Priorities 	<ul style="list-style-type: none"> • Priority landslide areas exist along roadways in the county • Long history of mining in the county
Structure Fires	<ul style="list-style-type: none"> • Historical fire records • Public meeting input 	<ul style="list-style-type: none"> • Economic importance of downtown Anaconda
Terrorism and Civil Disorders	<ul style="list-style-type: none"> • Centers for Disease Control website • Anaconda-Deer Lodge Emergency Operations Plan • Southern Poverty Law Center website • Anti-Defamation League website 	<ul style="list-style-type: none"> • Heightened alert since September 11, 2001 • Small scale incidents have occurred in Deer Lodge County
Utility and Communications Outage	<ul style="list-style-type: none"> • Public meeting input 	<ul style="list-style-type: none"> • Dependence of population on utility services • Dependence of emergency services on communications

Table 4.1 (continued) Hazards Identified in Deer Lodge County, Montana

Hazard	How Identified	Why Identified
Volcano	<ul style="list-style-type: none"> • Montana Hazard/Vulnerability Analysis • Public meeting input 	<ul style="list-style-type: none"> • History of ash fall over county • Proximity to Yellowstone Caldera
Wildfire	<ul style="list-style-type: none"> • DNRC records • USFS records • Public meeting input • Subject matter experts 	<ul style="list-style-type: none"> • Mountainous, forested, and flammable terrain exists throughout the county • History of significant wildfires • Growth in the wildland/urban interface
Wind, Tornadoes, and Severe Thunderstorms	<ul style="list-style-type: none"> • National Climatic Data Center database • National Weather Service website 	<ul style="list-style-type: none"> • High winds and severe thunderstorms, some causing damage, have occurred in recent history
Winter Storms and Extended Cold	<ul style="list-style-type: none"> • Western Regional Climate Center database • Public meeting input 	<ul style="list-style-type: none"> • History of road closures due to winter conditions • Potential for power outages during a cold spell

Assets and Community Inventory

An important piece of assessing the risk of the community to the studied hazards is to recognize what assets are more vulnerable to those hazards than others. Identifying the assets in the community is the first step in assessing the vulnerabilities. In many cases, once important facilities are identified, they can then be prioritized for mitigation. Examples of community assets include the population, critical facilities, government (publicly owned) facilities, businesses, residences, structures housing vulnerable populations, road and utility infrastructure, natural resources, and the economy. The most important facilities typically protect the continuity of government, the safety of the population, or the economy.

Critical Facilities

Two different types of critical facilities exist, those that are necessary to maintain essential community services, and those that house vulnerable populations. Those facilities that are considered vital to public safety such as law enforcement, fire services, health services, communications, hazardous materials storage, and other government services have been identified as **critical facilities**. Examples of facilities housing particularly vulnerable populations include elderly housing, schools, jails, and shelters. These facilities were identified by the LEPC and through additional research. The tables and maps that follow specify the critical facilities and locations of vulnerable populations. Replacement values, where shown, are from the Anaconda Deer Lodge (MMIA) NPX Property Schedule.³ Time and resource constraints prohibited the collection of all values for all structures. Future development of this plan may allow for a more in-depth analysis.

³ Robert F. Driver Associates. Anaconda-Deer Lodge (MMIA) NPX Property Schedule. February 2002.

Table 4.2 Critical Facilities – Local Government Facilities

Name	Address	Size (sq. ft)	Replacement Value (\$)	Contents Value (\$)	Source of Info.	Notes
County Courthouse (Administrative Offices, Ambulances, Jail, and Garages) <i>Does not include new Law Enforcement Center</i>	800 Main Street	52,995	\$2,170,800	\$244,600	LEPC, Property Schedule	Built 1898 with additions/garages in 1910, 1921, 1941, 1972, 1973, 1974, 1976, 1983, 1985
Water Department	50 North Main Street	5,828	\$112,000	\$9,000	LEPC, Property Schedule	Built in 1992
Lands Department	7916 MT Highway One West	N/A	N/A	N/A	LEPC	State owned
Coroner's Office/Historical Society	118 East Seventh	N/A	N/A	N/A	LEPC	Leased
Library	Fourth & Main Streets	9,876	\$1,712,000	\$803,400	LEPC, Property Schedule	Built in 1898
Search and Rescue	MT Highway One, across from Town Pump East				DES Coordinator	

Table 4.3 Critical Facilities – Fire Stations

Name	Address	Size (sq. ft)	Replacement Value (\$)	Contents Value (\$)	Source of Info.	Notes
Anaconda	420 West Commercial	5,996	\$272,000	\$11,200	LEPC, Property Schedule	Built 1979
Opportunity	Stewart & Hauser, Opportunity				DES Coordinator	
Racetrack Valley	N/A				DES Coordinator	Located in Powell County
Warm Springs	Montana State Hospital, Warm Springs				DES Coordinator	State-owned
Galen	Galen State Campus, Galen				DES Coordinator	
Antelope Gulch/Lost Creek	Lost Creek				DES Coordinator	
West Valley	Mount Haggin & Warren				DES Coordinator	
Georgetown Lake	100 Fire Lane				DES Coordinator	Includes ambulance quick response unit

Table 4.4 Critical Facilities – Water and Sewer Facilities and Storage

Name	Address	Size (sq. ft)	Replacement Value (\$)	Contents Value (\$)	Source of Info.	Notes
Wastewater Treatment Plant	MT Highway One & MT Highway 48	880	\$1,726,400	\$352,500	LEPC, Property Schedule	Processes 1-1/2 MG per day, Built in 1987 & 1994
Water Storage	End of Evergreen				LEPC	4 MG storage
Well Houses	N. Cable Road	5,668	\$300,000	\$333,800	Property Schedule	Built in 1994
Silver Lake Flume (not mapped)	Silver Lake	N/A	N/A	N/A	DNRC	Wooden flume critical to industry in Butte

Note: No security at these facilities.

Table 4.5 Critical Facilities – Communications Facilities

Name	Address	Size (sq. ft)	Replacement Value (\$)	Contents Value (\$)	Source of Info.	Notes
Radio Repeater Building (not mapped)	Rumsey Mountain	196	\$5,000	\$80,000	Property Schedule	Located in Granite County
Radio Repeater Building (not mapped)	“C” Hill	100	\$5,000	\$80,000	Property Schedule	

Table 4.6 Critical Facilities – Transportation Facilities

Name	Address	Source of Information	Notes
BAP Rail Yard	Willow & Park Streets	DES Coordinator	Owned by Rarus Railroad
Car Barns	Willow & Park Streets	DES Coordinator	Houses school buses
Bowman Field Airport	Highway 48	DES Coordinator	

Table 4.7 Critical Facilities – Energy Facilities

Name	Address	Source of Information	Notes
Northwestern Energy Offices	1000 East Commercial	DES EOP	Possible PCB transformer oil storage
Bonneville Power Substation	Mill Creek & Willow Glen Roads	DES Coordinator	Possible PCB transformer oil storage
Northwestern Energy Substation	North Cedar	DES EOP	Possible PCB transformer oil storage
Northwestern Energy Substation	Mill Creek Road	DES Coordinator	
Natural Gas Line (24”) (not mapped)	Morrel Road	DES Coordinator	

Note: No security at these facilities. About 1.6 million people served from these locations.

Table 4.8 Critical Facilities – Hazardous Materials Facilities

Name	Address	Source of Information	Notes
Magnum – Petroleum – Beck Fuel	323 East Pennsylvania Street	DES EOP	Gas-Oil-Diesel, 1000 ft evacuation
Albertson's/Osco Drug	1300 East Park Avenue	DES EOP	Hardware Store & Paint Products
Safeway	Park & Larch	DES EOP	Hardware Store
Hardware Hank	216 West Park	DES EOP	Hardware Store & Paint Products
D&L Auto Sales	200 East Commercial	DES EOP	Paint Products
Dye's Auto Parts	107 Main	DES EOP	Paint Products
Peterson Paints	124 East Commercial	DES EOP	Paint Products
Dee's Motors	1200 East Commercial	DES EOP	Paint Products
Cook's Collision	416 East Park	DES EOP	Paint Products
Thriftway Super Stop	1420 East Commercial	DES EOP	Propane Storage & Gasoline
Town Pump East	Montana One West	DES EOP	Propane Storage & Gasoline
Town Pump West	819 West Park	DES EOP	Propane Storage & Gasoline
Washoe Park Swimming Pool		DES EOP	Chlorine Gas Storage
Memorial Gym	Fifth & Hickory	DES EOP	Chlorine Gas Storage
Fairmont Hot Springs	East of Anaconda	DES EOP	Chlorine Gas Storage
Montana State Hospital	Warm Springs	DES EOP	Chlorine Gas Storage/Propane/Gas
Anaconda Foundry	Sixth & Jefferson	DES EOP	Acetylene Storage
Anaconda-Deer Lodge County Shop	800 South Main	DES EOP	Acetylene Storage
Anaconda Job Corps Center	1407 Foster Creek Road	LEPC	Paint Products, Diesel
Anaconda-Deer Lodge Water Department	50 North Main Street	LEPC	Chlorine
Anaconda-Deer Lodge Weed Department	Southeast corner of Pennsylvania and Cedar	LEPC	Herbicide chemicals

Note: None are required to report as part of SARA Title III

Table 4.9 Critical Facilities – State Facilities

Name	Address	Source of Information	Notes
DNRC	7916 Montana One West	DES EOP	
Montana National Guard*	101 North Polk Street	DES EOP	Approx. Capacity of 100
DPHHS, Anaconda Public Assistance	307 East Park	Research	
Dept. of Transportation	Polk Avenue	Research	
Montana State Hospital^	Warm Springs	Montana Statewide Hazard Assessment	Approx. 600 Staff and Patients \$46,127,226 in structure value, \$7,623,973 in contents value
Galen State Hospital^	Galen	DES Coordinator	

* denotes a potential shelter/evacuation center

^ denotes listing in multiple categories

Table 4.10 Critical Facilities – Federal Facilities

Name	Address	Source of Information	Notes
US Post Office	218 Main Street	Research	
US Post Office	1 Railroad, Warm Springs	Research	

Table 4.11 Vulnerable Populations – Hospitals, Assisted Living, and Senior Facilities

Name	Address	Source of Information	Beds
Anaconda Community Hospital	Pennsylvania	DES EOP	42
Hearthstone	Fourth & Oak	DES EOP	96
New Horizons	Jefferson	DES EOP	12
Hagan Manor (Housing Authority)	415 East Park Avenue	DES EOP, Property Schedule: 1,070 sq. ft., \$66,400 value, built in 1905	40
Community Nursing Home of Anaconda	615 Main	Property Schedule: 850 sq. ft., \$92,962 value, built in 1972	62
Metcalf Senior Citizen Center*	100 East Pennsylvania	DES EOP, Property Schedule: 6000 sq. ft., \$482,000 value, built in 1977	N/A
Warm Springs State Hospital^	Warm Springs	DES Coordinator	
Galen State Hospital^	Galen	DES Coordinator	

* denotes a potential shelter/evacuation center

^ denotes listing in multiple categories

Table 4.12 Vulnerable Populations - Schools

Name	Address	Source of Information	Population
Anaconda Senior High School*	Fifth & Main Streets	DES EOP	459
Fred Moodry Middle School*	219 East Third Street	DES EOP	255
Dwyer Primary*	1601 Tammany Street	DES EOP	214
Dwyer Intermediate*	1510 West Park	DES EOP	184
Lincoln Elementary*	506 Chestnut	DES EOP	276
AHS Annex	Fourth & Main Streets	DES EOP	200 (estimate)
A.W.A.R.E., Inc.^	1400 Lighthouse Road, Galen	DES EOP	20
RYO Correctional Facility^	1316 Galen Road, Galen	DES EOP	60 per shift
Anaconda Job Corps*^	1407 Foster Creek Road	LEPC	260

* denotes a potential shelter/evacuation center

^ denotes listing in multiple categories

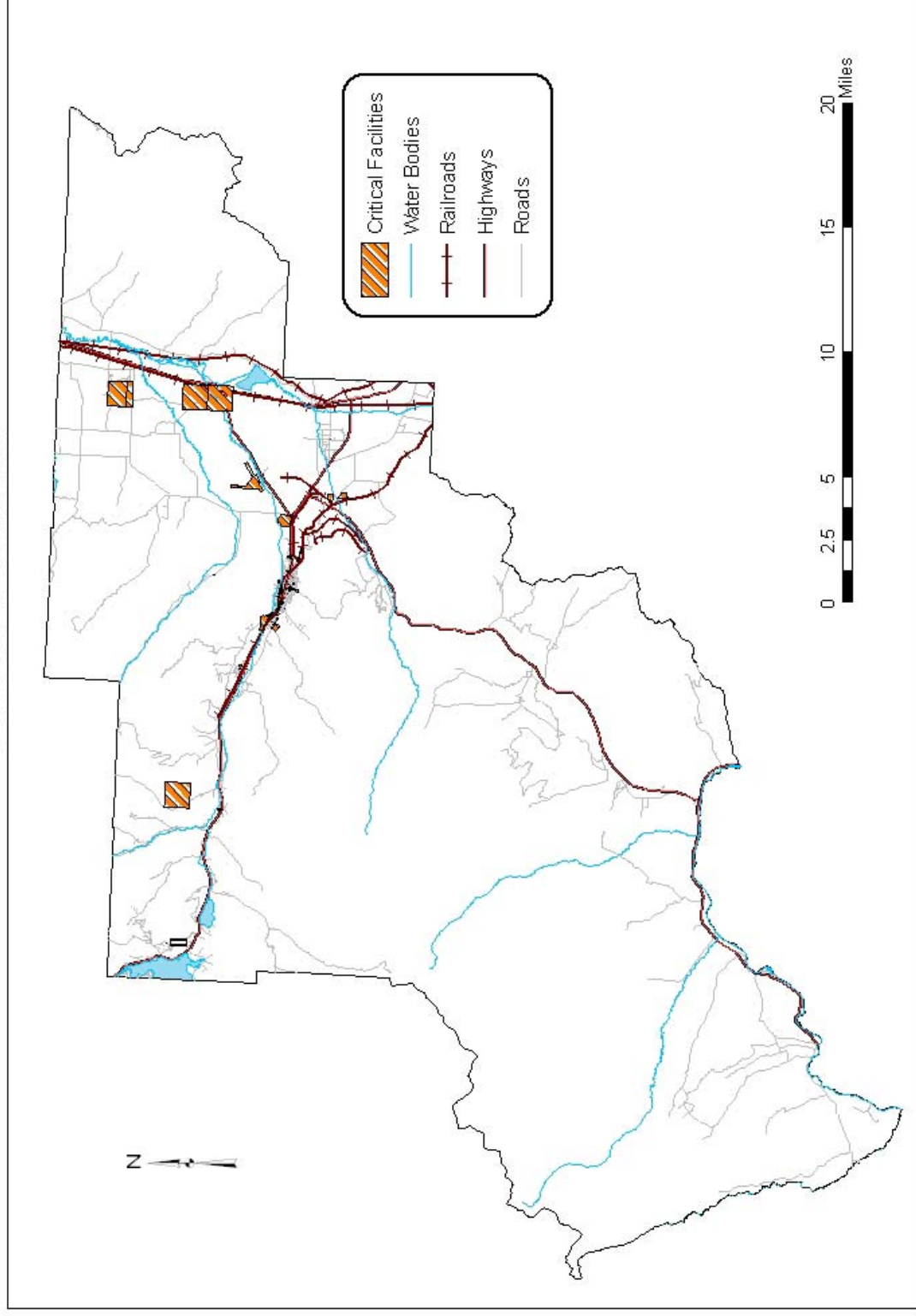
Table 4.13 Vulnerable Populations – Large Day Care Facilities

Name	Address	Source of Information	Notes
Headstart	315 West Fourth	DES EOP Property Schedule	6,600 sq. ft., \$80,000 value, Built in 1980
Anaconda PCA Family Resource Center	229 East Commercial	DES EOP	

Table 4.14 Vulnerable Populations – Potential Shelters
(in addition to those with * in previous tables)

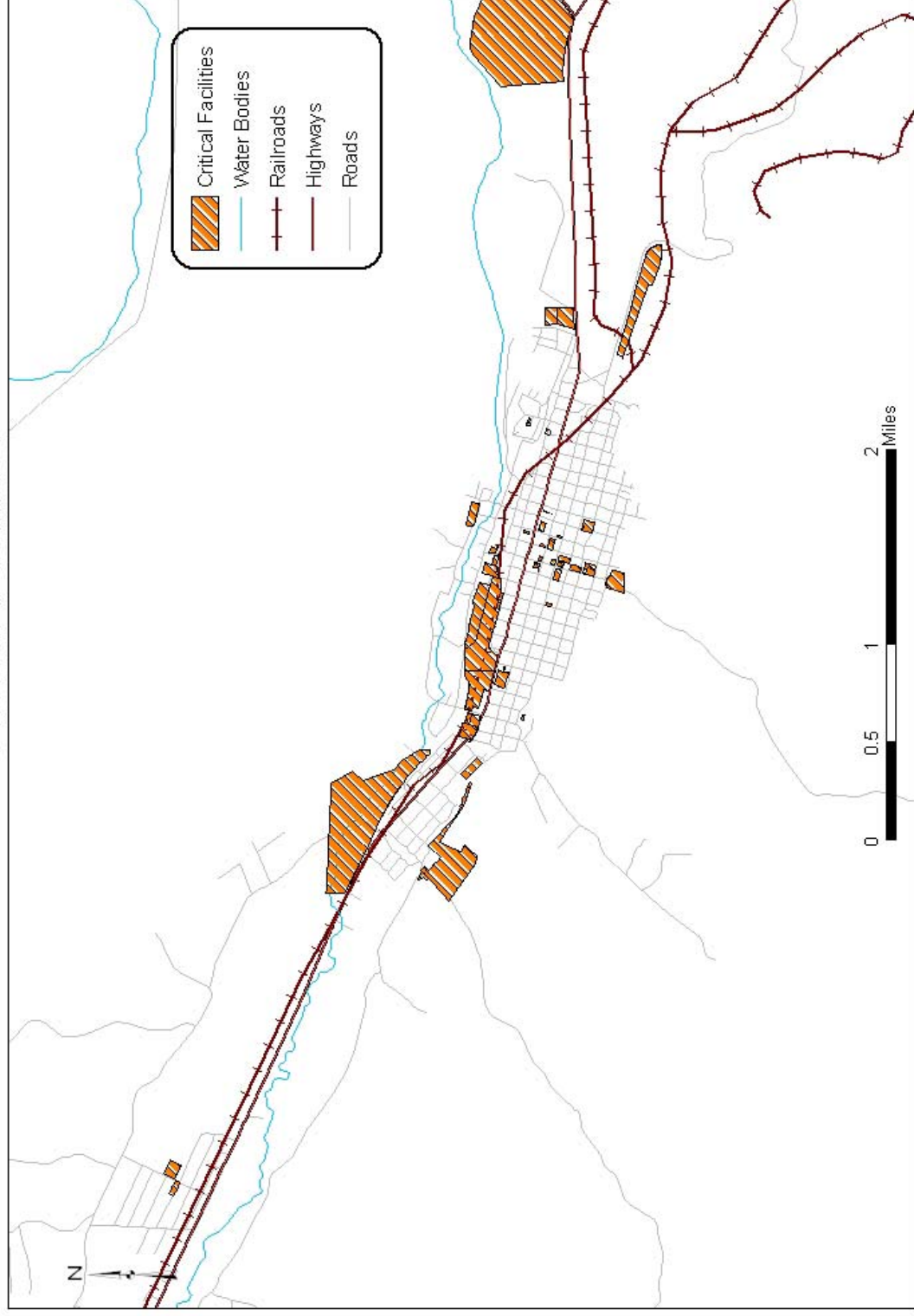
Name	Address	Source of Information	Approximate Capacity
Washington School	901 West Fifth	DES EOP	
Anaconda Elks Club	223 Main	DES EOP	300
LDS Church	1300 West Park	DES EOP	200
Anaconda Catholic Community Center	217 West Pennsylvania	DES EOP	500
Grace Baptist	Fifth & Cedar Streets	DES EOP	75
Assembly of God	300 East Fourth	DES EOP	100
Hope Lutheran	Washoe Park Drive	DES EOP	500
Methodist	Third & Oak	DES EOP	300
St. Mark's Episcopal	601 Main	DES EOP	80
Mount Haggin Baptist	201 Warren	DES EOP	100
Presbyterian	Fourth & Main	DES EOP	100
Church of Christ	300 Evergreen	DES EOP	25
West Valley Community Center	Mount Haggin & Warren	DES EOP	
Opportunity Community Center	Stewart & Hauser, Opportunity	DES EOP	50

Deer Lodge County, Montana Critical Facilities



Data Source: Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) Database 2004
LEPC Input

Greater Anaconda Area, Montana Critical Facilities



Data Source: Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) Database 2004
LEPC Input

Non-Critical Government Facilities

In addition to the critical facilities and vulnerable populations, Anaconda-Deer Lodge County owns other facilities that are not necessary for the continuity of government or the protection of the population, but would be government losses, if damaged. These non-critical government facilities are listed in Table 4.17.

Table 4.17 Non-Critical Facilities – Anaconda-Deer Lodge County Owned

Name	Address	Size (sq. ft)	Replacement Value (\$)	Contents Value (\$)	Source of Info.	Notes
Washoe Park Facilities	Pennsylvania & Sycamore	21,660	\$411,100	\$63,400	Property Schedule	Segments built in 1870, 1915, 1935, 1949, 1977, 1985, and 1994
City Shop	North Cedar	1,300	\$35,500	\$6,000	Property Schedule	Built in 1973
Bitterroot Warehouse	300 West Pennsylvania	5,000	\$0	\$11,200	Property Schedule	Built in 1900
Recreation Office	923 West Fifth	2,500	\$47,000	\$154,000	Property Schedule	Built in 1976
Ben Goodman Park	East Fourth	3,168	\$31,000	\$3,300	Property Schedule	Built in 1974
Haeffner's Pump Station	East End of Old Cable Road	747	\$19,800	\$5,400	Property Schedule	Built in 1900
Junction House	Tamarack & Washoe	446	\$16,600	\$5,500	Property Schedule	Built in 1938
City Commons Bandstand		525	\$22,000	\$0	Property Schedule	Built in 1910
East Anaconda Yards	2401 East Fourth	1,060	\$47,000	\$1,100	Property Schedule	Built in 1960
Martin Sports Complex	200 North Jackson	8,000	\$750,000	\$27,000	Property Schedule	Built in 1993
Trail Shelters	Old Works Trail	2,550	\$45,000	\$0	Property Schedule	Built in 1996
Golf Course	1205 Pizzini	5,760	\$737,350	\$0	Property Schedule	Built in 1997
Chamber of Commerce	306 East Park	1,920	\$50,000	\$0	Property Schedule	Built in 1978

Buildings

In addition to the critical facilities and government-owned structures, residences, businesses, and other facilities are also vulnerable to hazards. Based on 2000 US Census Data, the population of Deer Lodge County is 9,417 with 4,958 housing units. The median value of those owner-occupied housing units is \$70,700. Also, 237 private, non-farm establishments and 5,007 non-employer establishments exist. A further breakdown of the housing units can be found in Table 4.18.

Table 4.18 2000 US Census Housing Data

Units in Structure	Number
1-unit, detached	3,879
1-unit, attached	139
2 units	115
3 or 4 units	151
5 to 9 units	59
10 to 19 units	68
20 or more units	255
Mobile home	289
Boat, RV, van, etc.	3
Year Structure Built	Number
1999 to March 2000	55
1995 to 1998	158
1990 to 1994	111
1980 to 1989	156
1970 to 1979	588
1960 to 1969	458
1940 to 1959	1,572
1939 or earlier	1,860
Value	Number
Less than \$50,000	811
\$50,000 to \$99,999	1,252
\$100,000 to \$149,999	355
\$150,000 to \$199,999	72
\$200,000 to \$299,999	33
\$300,000 to \$999,999	0
\$1,000,000 or more	6
MEDIAN	\$70,700

Using this census data, the total value of residential structures in Deer Lodge County can be estimated at \$350,530,600 (4,958 housing units * \$70,700/unit). HAZUS-MH, a loss estimation model used in the earthquake hazard analysis, has its own database, derived from national data sources, that differs from the census data. Table 4.19 shows the building stock estimates for Deer Lodge County.

Table 4.19 HAZUS Building Stock Replacement Values for Deer Lodge County, Montana

Type	Replacement Value
Government	\$117,000
Commercial	\$49,050,000
Industrial	\$2,226,000
Agricultural	\$195,000
Religion	\$1,996,000
Education	\$2,301,000
Residential	\$633,282,000

Tables 4.18 and 4.19 demonstrate the significant differences in the data that can be used. The default HAZUS data, for example, appears to be low for government and agriculture building stock, but high

June 2005

for residential building stock when compared to the census data. The US Census data will be used for all hazard profiles except the one for earthquake.

Population

US Census data defines the 2000 population of Deer Lodge County as 9,417 people. The population of Deer Lodge County is primarily located in and around Anaconda. Table 4.20 lists the percentages by area.

Table 4.20 Anaconda-Deer Lodge County Population Distribution¹

Area	Percent of Population
Anaconda*	68.5%
Georgetown Lake *	0.8%
Opportunity*	6.7%
Big Hole Valley†	1.0%
Warm Springs/Galen*	3.8%
West Valley	13.4%
Remainder of County†	5.8%
Total	100%
Notes:	
* Source: 2000 Census Block Population Map Summary	
† Estimate	

The median age of 42.3 years in Deer Lodge County is significantly older than the statewide median of 37.5 years. According to 2000 US Census data, 18.8% of the residents or 1,770 people are over 65 years old, compared to the state figure of 13.4%. Therefore, Deer Lodge County has a significantly higher elderly and special needs population as compared to the rest of the state.

Infrastructure

Significant infrastructure supporting area communities and the Northwest United States exist throughout Deer Lodge County. Most residents receive their electricity and natural gas from Northwestern Energy and telephone services from Qwest. Several cellular telephone towers are also present and are owned by various entities. The major roadways and most of the roads and bridges within Anaconda are paved. Outside county roads, however, are frequently gravel. US Census TIGER data shows that approximately 580 miles of roadway exist in Deer Lodge County.⁴ The value of county owned vehicles and heavy equipment is \$3,685,845 and \$935,000 respectively.³

Anaconda is served by a public water supply with the facilities servicing the public water supply and sewage treatment outlined in Table 4.4. The Anaconda water supply comes from six wells near Warm Springs Creek on the western outskirts of Anaconda. This system includes chlorine disinfection, services approximately 6,224 people with 2,997 hook-ups, and has an average demand of 3.53 million gallons per day.¹ The Anaconda wastewater system has roughly the same service population. The community of Warm Springs is served by the Anaconda water supply, and Galen has its own central water system, owned by the State of Montana. Warm Springs and Galen each have their own wastewater systems. Many subdivisions and housing developments additionally have their own

⁴ US Census Bureau. <http://www.census.gov/geo/www/tiger/>

systems based on demand and water quality control requirements. Buildings in the more rural parts of the county are often served by individual wells and septic systems.

Deer Lodge County supports several major regional electric transmission lines and substations. These lines pass through the eastern part of the county from Silver Bow County to Powell County. The major substations service roughly 1.6 million people in the Northwest United States.

Economy

For many years, the Deer Lodge County economy was driven by the mining industry. Today, the economy is a bit more diversified. Table 4.21 shows the 1997 Economic Census data for Deer Lodge County.

Table 4.21 1997 Economic Census Data for Deer Lodge County, Montana⁴

Description	Number of Establishments	Sales, Receipts, or Shipments
Retail trade	42	\$49,535,000
Accommodation & food services	39	\$12,209,000
Health care and social assistance	30	\$9,151,000
Arts, entertainment, and recreation	10	\$8,460,000
Professional, scientific, and technical services	10	\$2,691,000
Other services (except public administration)	9	\$1,842,000
Administrative, support, waste management, and remediation services	4	\$1,068,000
Real estate, rental, and leasing	7	\$1,020,000
Wholesale Trade	2	D
Mining (not published for counties)	N	N
Utilities (not published for counties)	N	N
Construction (not published for counties)	N	N
Transportation and warehousing (not published for counties)	N	N
Information (not published for counties)	N	N
Finance and insurance (not published for counties)	N	N
Management of companies and enterprises (not published for counties)	N	N
Manufacturing (none)	0	\$0
Education services	0	\$0

D = Withheld to avoid disclosure

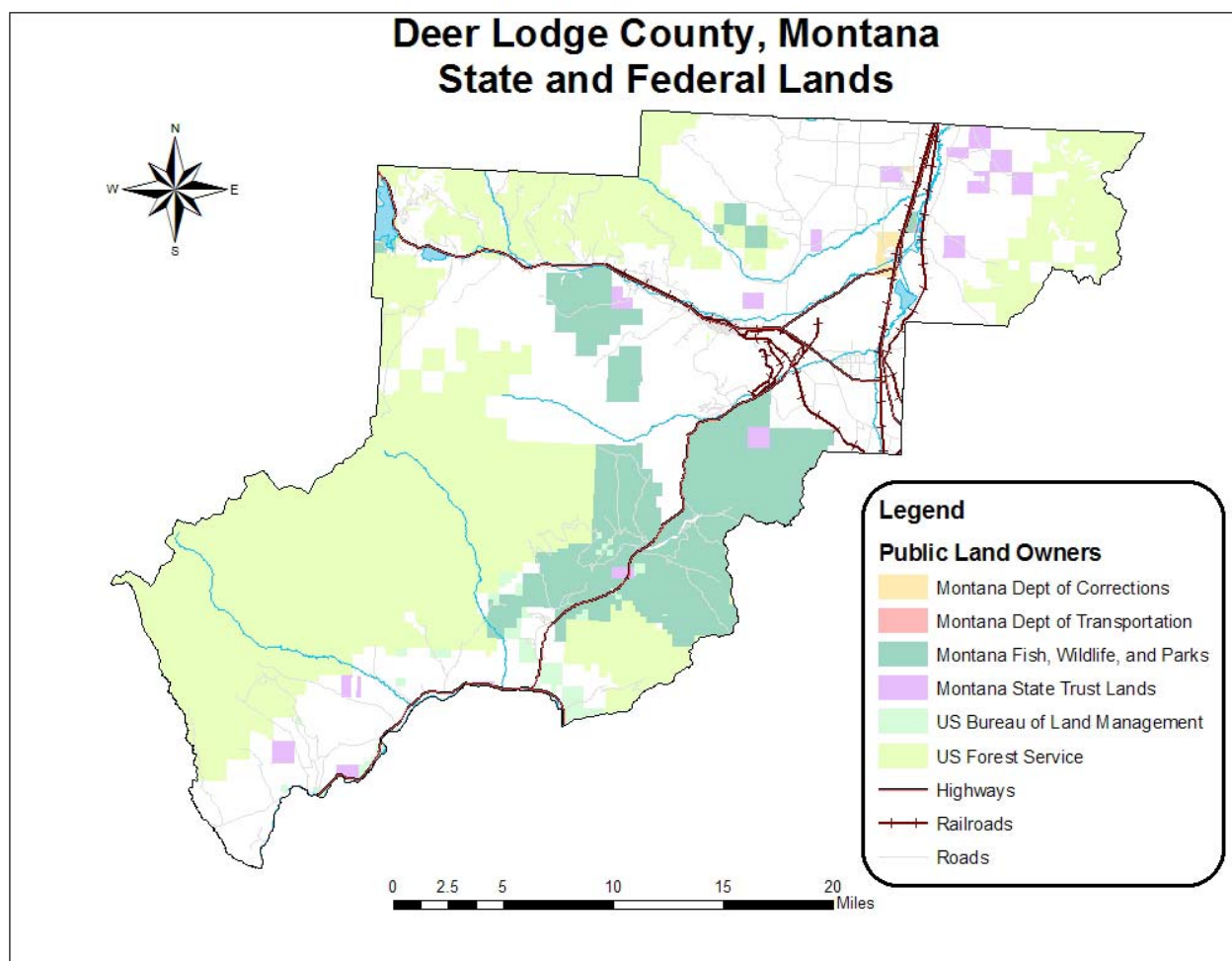
N = Not available

Land Use and Future Development

Anaconda was once a much larger community in the early 1900's with a population of over 18,000. Currently, with the Deer Lodge County population at 9,417, population figures are beginning to stabilize after years of population loss. Projections show that the number of people in Deer Lodge County will continue to show a net decrease over the next five years, but then begin to increase.⁵ Most of the population losses are in the developed parts of the county such as Anaconda, Opportunity, and West Valley. Areas that are seeing an increase in development and population are Georgetown Lake and the mountainous regions south of Anaconda. These areas are generally expected to continue to grow but the exact locations where development will occur in the future and the numbers of structures are unknown. The types of structures are primarily residential.

Map 4.22 shows the land within Deer Lodge County that is federally or state owned. Map 4.23 then shows the federal and state lands in gray with the general land use for the remaining private and locally owned property.

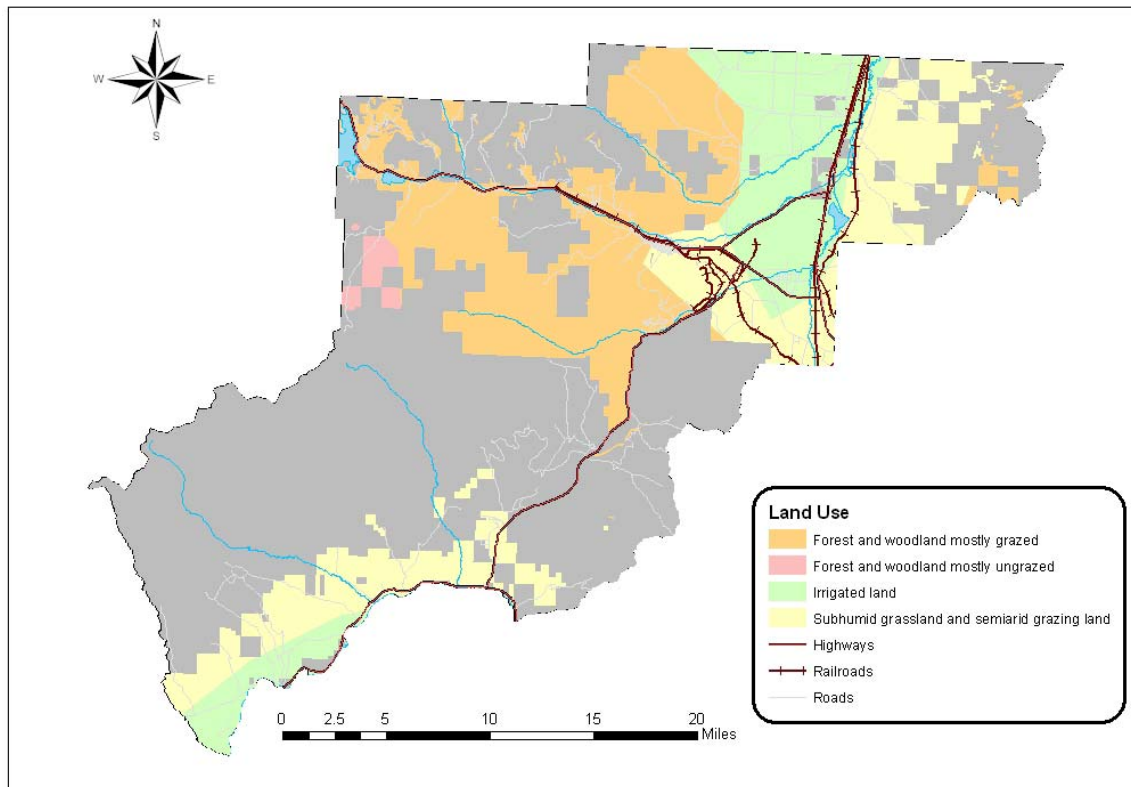
Map 4.22



⁵ Montana Department of Commerce, Census and Economic Information Center. May 2005.
<http://ceic.commerce.state.mt.us/>

Map 4.23

**Deer Lodge County, Montana
State and Federal Lands with Land Use**



Anaconda-Deer Lodge County does not currently have a growth policy plan, but the county does have a land use permit system consisting of the Anaconda-Deer Lodge County Development Permit System⁶ and the Anaconda-Deer Lodge County Subdivision Regulations⁷. Both governing documents are dated 1992 and 1994 respectively. These documents guide the current and future development. A summary of each document and how they pertain to hazard mitigation follows. In addition, Anaconda-Deer Lodge County also has a local building code enforced.

Anaconda-Deer Lodge County Development Permit System - December 2, 1992

The permit system in Anaconda-Deer Lodge requires a land use permit for all development. The only specific requirements related to hazard mitigation pertain to flooding. This document creates a floodplain overlay district that recognizes the National Flood Insurance Program requirements outlined in Anaconda-Deer Lodge County Ordinance 106. The permit system also requires culverts and bridges on natural watercourse be designed by a professional engineer and pass the 100-year flood without damage to the bridge or culvert and without diverting floodwaters. Those culverts and bridges not on a natural watercourse must pass runoff from a 10-year, 6 hour storm event.

The Georgetown Lake Development District outlined in the permit system has more robust mitigation requirements. This district requires runoff and erosion control measures for large developments and

⁶ Anaconda-Deer Lodge County Development Permit System, December 2, 1992.

⁷ Anaconda-Deer Lodge County Subdivision Regulations, January 1994.

includes enhanced wetland, stream, and lakeshore protections. The district also requires a wildfire prevention plan and mitigation. Development is restricted on slopes over 25% or those identified as unstable.

Anaconda-Deer Lodge County Subdivision Regulations, January 1994

The subdivision regulations govern the creation of subdivisions throughout the county. Minor subdivisions are considered to be five or less lots and major subdivisions greater than five lots. The documented purposes of the regulations address some of the topics related to hazard mitigation. For example, one purpose of the regulations is, “The avoidance of danger or injury by reason of natural hazard or the lack of water, drainage, access, transportation or other public services.” This purpose calls for the protection of life but does not go as far as addressing the protection of property. Additionally supporting this purpose is the requirement, “The planning board shall consider the following: relevant evidence relating to the public health, safety, and welfare;” (II-B-3,a,1).

“Low Impact” Minor Subdivisions do not have as restrictive development requirements as other subdivisions, but the regulations state that the subdivision must not be located on land “subject to natural or man-made hazards.” All subdivisions must “be suitable for subdivision” which considers flooding, snow avalanches, rock falls, landslides, and other hazards. Additional restrictions are placed on land in the floodway or deemed subject to flooding by the governing body. Proper drainage is also required and the governing body can require fire fighting facilities.

With respect to wildland fire, subdivisions are not prohibited in high fire hazard areas (as determined by the US Forest Service or Montana Department of Natural Resources and Conservation), but they must conform to special standards. These special standards include two entrance/exit roads, the road right of way be cleared of slash, and bridges be designed for loads of 20 tons and constructed from non-flammable materials. Structures are prohibited on forested slopes greater than 25% and on specific topographical features. The minimum lot sizes are as follows:

% Slope	Open Grass	Forest & Brush
0-10	1 acre	2 acres
10-20	2 acres	3 acres
20-25	3 acres	4 acres
Over 25	5 acres	Not permitted

The subdivision regulations also contain water supply requirements:

- 500 gallons/minute for lots one acre or more
- 750 gallons/minute for lots one acre or less with no central water
- 500 gallons/unit with a minimum of 4,000 gallons available

Anaconda-Deer Lodge County Capital Improvements Plan, July 2002¹

The Capital Improvements Plan for Anaconda-Deer Lodge County establishes priorities for large scale infrastructure projects. The majority of priorities/projects are not specific to disaster mitigation but are related to the upkeep of existing systems and facilities and the purchase of equipment to enhance public safety.

Vulnerability Assessment Methodology

The vulnerability assessment was conducted using a combination of GIS analysis techniques and ballpark estimates. While some hazards have digital data depicting the degree of risk across the countywide area, others do not. Where possible, the digital data was used. Otherwise, a plausible scenario was created, and based on community values, potential losses were estimated.

Deer Lodge County does not currently have structures mapped into a GIS database. Therefore, the Montana Department of Revenue Computer Assisted Mass Appraisal System (CAMA) system was used to delineate what parcels of land had taxable structures on them. This data was limited by the fact that it did not cover the Georgetown Lake area, nor did it locate where the structure or structures were located on the parcel. This database, however, did provide structure values for the parcels. Whenever possible, the hazard area was overlaid on the parcel data to determine an estimated number of structures and the associated structure replacement values that lie within that hazard area. For the Georgetown Lake area, the fire department provided an estimate of the total number of structures in the area within Deer Lodge County and estimates of those in certain hazard areas.

In most cases, the total dollar exposure was multiplied by a damage factor since many events will not result in a complete loss of all structures. Frequently, only parts of the hazard area are affected or structures don't suffer a complete loss and may have only minor damage. These figures, of course, will only represent estimates but are based on current hazard and exposure data. Whenever possible, losses were estimated based on factors listed in the FEMA *State and Local Mitigation Planning How-to Guide: Understanding Your Risks*.

Critical facilities were identified by the Local Emergency Planning Committee (LEPC) and the parcels were then selected from the Department of Revenue's CAMA database. The same methodology used for taxable structures was used for the critical facilities.

The population impacts were qualitatively assessed based on the percentage of the population estimated to have residences in the hazard area and the general warning time that could be expected. The loss of life and possible injuries are difficult to determine and would be dependent on the time of day, event location, and hazard specific circumstances.

Hazard Profiles

AVALANCHE

Description

An avalanche occurs when a section of snow gives way to gravity. When snow accumulations on a slope cannot be supported any longer, the snow support structure may break and fall creating an avalanche. The subsequent rush of unsupported snow can bury and move things in its path. They frequently occur with little, if any, warning. The majority of avalanches do not cause any damage; occasionally however, people and property may fall in their paths.

According to the Montana Disaster and Emergency Services website, “If it is assumed that an accumulation of snow is possible anywhere in Montana, then we can evaluate the potential for hazard solely on the basis on terrain characteristics. The most important factor by far is terrain steepness. Wet snow avalanches can start on slopes of 20 degrees or less, but the optimum slope angle for avalanche starting zones is 25-45 degrees. Slopes steeper than 45 degrees will not normally retain enough snow to generate large avalanches, but they may produce small sluffs that trigger major avalanches on the slopes below. Therefore, all slopes of 20 degrees and greater should be considered as potential avalanche sites.”⁸

History

The history of avalanches in Deer Lodge County is very limited. Most avalanches occur in remote areas with little if any damages. Occasionally, however, avalanches can impact people and/or property. Only four instances of significance have been noted by LEPC members or were found in historical avalanches records. These noteworthy events are:

- December 26, 2000 – Three boys were injured in an avalanche while skiing in a closed section of the Discovery Basin Ski Resort.⁹
- Early 1990’s – Two fatalities in an avalanche near Miller Lake⁹
- Mid 1980’s – An avalanche occurred near Cable Creek (Northwest Deer Lodge County)¹⁰
- February 28, 1967 – Two small houses were lost to an avalanche in Anaconda⁹

None of these relatively small instances of avalanches have resulted in a federal or state disaster declaration.

Probability

The Colorado Avalanche Information Center has compiled statistics on a statewide basis on avalanche fatalities. Montana ranks fifth in the nation with over 50 fatalities from 1950/51 to 2000/01. Looking at the activities the individuals were undertaking at the time of the avalanche, climbing, backcountry skiing, and snowmobiling rank as the top three. Based on the history of avalanches in Deer Lodge

⁸ Montana Disaster and Emergency Services, <http://discoveringmontana.com/dma/des/>.

⁹ CyberSpace Avalanche Center, <http://www.csac.org/>.

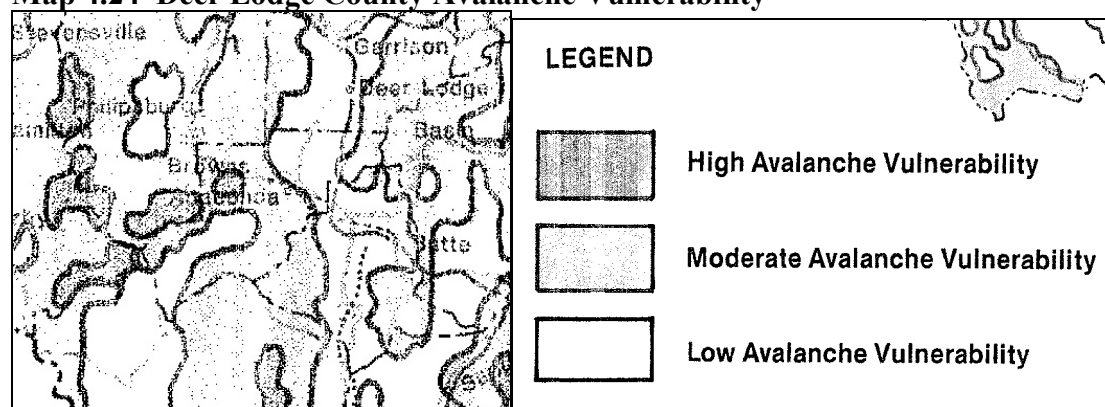
¹⁰ LEPC/Public Meeting Input

County, a few fatalities can be expected every few decades and property damage is possible, but neither is very likely. The probability of an avalanche to cause enough damage for a county, state, or federal disaster is considered very low based on the historical record.

Mapping

A map titled *Vulnerability to Avalanches in Montana* published in the *Montana Hazard/Vulnerability Analysis* from 1987 shows the very general areas within Montana that are considered vulnerable to avalanches. Map 4.24 shows an electronically scanned version of the legend and map zoomed to Deer Lodge County. Although somewhat difficult to read, the map shows the western parts of Deer Lodge County to be at greatest risk for avalanches with a moderate vulnerability extending across the western, central, and southeast parts of the County and another small section in the northeast corner. These areas coincide with the mountainous regions of the County.

Map 4.24 Deer Lodge County Avalanche Vulnerability¹¹



Associated Hazards and Other Factors

Avalanches often occur independently from other hazards but can occasionally be linked to significant winter storms and high wind events. During years of heavy snowfall and increased incidence of avalanches, a rapid snowmelt can then lead to flooding, a common problem in Deer Lodge County.

Vulnerability

Critical Facilities

Critical facilities in Deer Lodge County historically have not suffered losses or been threatened by avalanches. Not that a critical facility could not be impacted, but the probability is very low. Most facilities are located outside of mountainous areas prone to avalanches. Some critical facilities, such as the Anaconda-Deer Lodge Courthouse, are located on sloped terrain. The primary exceptions, however, are roadways and communications equipment. Typically, communications equipment, such as radio towers, are located on mountain peaks and are somewhat protected due to their locations near the peaks, but they are not immune to avalanches. Potential losses to roadways and communications

¹¹ Montana Disaster and Emergency Services, *Montana Hazard/Vulnerability Analysis*, 1987.

equipment could easily total into the hundreds of thousands of dollars, but the probability of such an event is considered very low.

Potential Losses

Like critical facilities, potential losses to other structures are considered low. Most avalanche prone areas are located on federal or state lands and do not have significant numbers of structures. The potential for economic losses is more likely yet probably not significant. An avalanche could destroy an area designated for logging, however, such an event may also create fallen timber for harvesting. With tourism being a large part of the regional economy, severe avalanche seasons could have an impact on the winter sports economy. Although the potential for economic losses exists, the potential is not considered significant.

Potential Population Impacts

Based the historical record, fatalities in Deer Lodge County occur infrequently. An average of one fatality per year over the past 50 years has been found across the entire state. The potential for population impacts from avalanches, especially when compared to other hazards, is considered very low. The greatest threat to the population from avalanches is to those participating in winter outdoor activities such as skiing, snowmobiling, and snowshoeing, particularly when conducted in the mountainous backcountry.

Impact of Future Development

The Anaconda-Deer Lodge County Subdivision Regulations specifically identify avalanche areas as unsuitable for subdivisions. This regulation does not, however, guide development that does not undergo subdivision review. The only exception is the Georgetown Lake Development District where development is restricted on slopes over 25%. In other parts of the county, and even in the Georgetown Lake area, development can possibly occur in avalanche prone areas. Fortunately, most of the land prone to avalanches is federally or state owned.

Data Limitations

The data on avalanches in Deer Lodge County is quite limited. These hazards are not expected to seriously threaten the community, and therefore, have not been studied thoroughly. The data that does exist is either on a national, not county-wide, scale or is old and somewhat obsolete. Avalanches are such site specific events that pinpointing specific vulnerable areas is quite difficult and costly. Therefore, this hazard profile is general in nature and could be more specific if better data is ever compiled. Irregardless, individual property owners are encouraged to consider these hazards specific to their site.

AVIATION

Description

Aviation accidents can occur for a multitude of reasons from mechanical failure to poor weather conditions to intentional causes. Accidents can vary from small single engine aircraft to large commercial jets. The location of the accident, such as a remote area versus a populated location, also plays an important role in the amount of destruction caused.

Deer Lodge County has one small airport, Bowman Field (3U3), 3 miles northeast of Anaconda at an elevation of 5,030 feet. Bowman Field serves non-commercial, private commuter, and recreational aircraft. The airport is owned by Anaconda-Deer Lodge County, has two paved runways, and serves an average of 126 aircraft operations/week.¹²

Commercial service is provided at a number of area airports, primarily Butte, Missoula, and Helena. Large passenger aircraft serving these airports and those traversing the region often fly over Deer Lodge County. Small aircraft accidents may be relatively minor in nature involving none or few casualties, whereas, a large commercial aircraft could create a mass casualty incident requiring outside assistance.

History

Table 4.25 briefly summarizes the accident reports filed by the National Transportation Safety Board as occurring in Deer Lodge County.

Table 4.25 NTSB Incident Report Summary for Fatal Accidents in Deer Lodge County¹³

Date	Casualties	Cause
September 8, 1987	2 fatal	Big Horn Sheep hunters crashed into the east wall of Bund Gulch while flying at low altitude.
March 6, 1986	3 fatal, 1 injured	Water in fuel and engine power problems prompted the pilot to attempt a forced landing but crashed into a tree in Goat Flats.
August 18, 1978	6 fatal	Pilot error during private flight to Butte, MT from Yelm, WA carrying a baseball team. Crash occurred on the hill above Evergreen Street.
December 28, 1977	2 fatal	Pilot, not instrument rated, took off during poor weather conditions and crashed shortly after takeoff.
April 16, 1965	1 fatal	Pilot, not instrument rated and having not flown in 8 years, took off in instrument conditions and crashed near Anaconda.

Another fatal accident by the Champion Mine in the 1990's was recalled by residents but a record of this accident was not found in the NTSB database. The NTSB database also had a record of 15 non-fatal, but damaging incidents since 1964.

¹² Statistics provided by www.airnav.com

¹³ Information derived from the National Transportation Safety Board aviation accident database. <http://www.nts.gov/>

Probability

As the historical record demonstrates, the probability for a private, small aircraft accident is much greater than one involving a large commercial jet in Deer Lodge County. Although an incident involving a commercial passenger flight and mass casualties cannot be ruled out, the probability is considered low. Since 1964, 14 fatalities from aircraft accidents have occurred in Deer Lodge County and a total of 20 incidents have been recorded by NTSB. Based on these statistics over a forty year period (1964-2003), a ten-year average can be derived. In an average ten-year period, 5 incidents causing damage can be expected involving 3.5 fatalities. The annual average is 0.5 incidents and 0.35 fatalities. Based on this history and public meeting input, the probability of a major disaster is considered moderate.

Mapping

The statistics show that fatal incidents primarily happen off-airport, however, many of the non-fatal incidents occur at the airport. Therefore, determining hazard areas based on the airport's location would only be minimally beneficial and would not show all hazard areas. Therefore, an analysis involving the proximity to the airport will not be completed here. The airport can be found in the maps depicting the critical facilities.

Associated Hazards and Other Factors

The hazard of aviation accidents can involve multiple factors. The two most significant include the location of the accident and the cargo on board. The location of an aviation accident will determine the significance of ground casualties and damages. An aircraft accident in a populated downtown area has a much greater potential for additional casualties and property damage than one that occurs in a remote part of the county. The location also affects the ability of responders to get to the crash site. The mountainous terrain in Deer Lodge County can make rescues and recovery difficult, particularly during inclement weather. The cargo is an important factor if such cargo would create a hazardous material release or increased fire hazard. Should the contents of the aircraft be hazardous, the situation would need to be treated not only as an aviation accident but also as a contaminated site. The possibility of an aviation accident as an intentional act cannot be ruled out, in which case, the accident site would also become a crime scene and possibly involve mass casualties.

Any hazard that involves aircraft in the response or recovery, such as wildfire suppression, could include an aircraft accident as an associated hazard. An example is a supply aircraft hauling recovery materials following a disaster. Severe thunderstorms, hail, and strong winds can all contribute to an increased hazard to pilots.

Vulnerability

Critical Facilities

All critical facilities in Deer Lodge County are considered to be at risk from aircraft accidents. Given the nature of historical events and the probability of a specific facility being hit, the overall vulnerability of any given critical facility is considered very low. The only infrastructure that can be

considered at a slightly higher risk are the tall communications towers and power lines. Again, however, the likelihood of this type of infrastructure coinciding with a crash site is considered low.

Potential Losses

In most aviation accidents in Deer Lodge County, the losses are limited to the people on board and the aircraft itself. Should an accident occur in a developed area, structural losses in the neighborhood of \$150,000 (2 homes x \$70,700/average home) plus ground casualties could be found. A large commercial jet in a developed area could potentially destroy an entire city block for a loss of roughly \$700,000 (assuming approximately 10 structures were destroyed). Additional losses, including potential economic losses, could result during a mass casualty incident of this magnitude.

Potential Population Impacts

The population impacts are going to be directly related to the type of aircraft involved, the number of people on board, the location of the accident, and the number of people in the area of the crash site. Typically, with aircraft accidents, very little warning exists so the population would be unaware until after the event occurred.

Impact of Future Development

Due to the somewhat random location of aircraft accidents, the impact of future development is generally the same regardless of where that development occurs, with the possible exception of in the immediate vicinity of the airport. An airport development district exists in Deer Lodge County that restricts development in the area directly surrounding the airport. Therefore, the impact of future development is considered minimal.

Data Limitations

The National Transportation Safety Board keeps very detailed records of damaging aircraft incidents. These records allow for in-depth analysis of individual accidents. The randomness of aircraft accidents, however, limits the usefulness of such information in determining the potential for losses and areas of greatest hazard. Data outlining the number of aircraft passing over Deer Lodge County and the areas they typically traverse would help to quantify the potential for additional major accidents.

COMMUNICABLE DISEASE and BIOTERRORISM

Description

Disease can be devastating to a community through its population or its economy. Human diseases, when on an epidemic scale, can lead to high infection rates in the population. Depending on the disease, quarantines and mass fatalities may result. Highly contagious diseases are the most threatening to the community, and even if the mortality rate is low in the general population, such as with influenza, the disease can be highly hazardous for the elderly, children, and those with suppressed immune systems.

Humans are not the only disease concern. Contagious animal and plant diseases could distress the agricultural community. In such a situation, food supplies and the economy would be threatened, depending on the disease and animal or plant affected. Known livestock and animal diseases such as Foot and Mouth, Chronic Wasting, Bovine Spongiform Encephalopathy (BSE or Mad Cow Disease), West Nile, and Brucellosis, among others, could have damaging effects on the livestock population.¹⁴

Diseases can be transported in a number of ways including naturally and intentionally. Naturally occurring diseases, some of which may not have even formed yet, could infect the population or agriculture with little notice. Others, such as influenza, may be particularly severe in any given year. Terrorists could use biological agents as a method of attack on both our population and food supplies.

History

Diseases are a part of everyday life. When they significantly impact the population, however, actions are taken to prevent additional infection. Fortunately, notable events have not occurred in Deer Lodge County in recent history, but in the early 1900's three events reached epidemic levels. The Spanish influenza outbreak after World War I in 1918-1919 caused 9.9 deaths per 1,000 people in the State of Montana.¹⁵ Historical records from area newspapers show that the influenza outbreak was so bad in 1918 that residents were quarantined from November 30 to December 17.

In nearby Butte, another quarantine was in place from September 15, 1934 to November 1, 1934 for children under the age of eighteen after seven cases of poliomyelitis (infant paralysis) were discovered. Residents recall a polio outbreak in Anaconda in the 1948-49 time period and claim the whole city of Anaconda was shut down after about 200 people were infected.

Recent years have not resulted in additional significant events, however, the 1979 and 2003 influenza season were particularly severe.

Probability

The probability of an epidemic in Deer Lodge County is rather difficult to assess based on history and current data. Medicine has improved significantly over the past 50 years and continues to do so every day. Given the urban nature of Anaconda and nearby Butte, the probability of rapid infection is somewhat greater than more rural parts of the county and state. With rapid worldwide travel, the

¹⁴ Montana Department of Livestock, <http://www.discoveringmontana.com/liv/>.

¹⁵ Brainerd, Elizabeth and Mark V. Siegler. The Economic Effects of the 1918 Influenza Epidemic. June 2002.

probability of an epidemic infecting humans, animals, or plants at some point in Deer Lodge County is considered high.

Mapping

The communicable disease and bioterrorism hazard is somewhat uniform across the county. The urban areas may be slightly more vulnerable to the rapid spread of disease in humans, however, the more rural areas are more vulnerable for animal and plant diseases. Therefore, mapping does not enhance this hazard profile.

Associated Hazards and Other Factors

Other disasters such as those that result in the loss or contamination of potable water or sanitary services may result in an increased probability of disease. Often following a large scale disaster, disease is a primary concern. The time of year and weather conditions may also be a factor in the development of an epidemic. A bioterrorism event may be tied to or done in conjunction with a larger scale terrorism event.

Vulnerability

Critical Facilities

Critical facilities are not structurally threatened by communicable disease and bioterrorism, however, their accessibility and function can be lost. Contamination of a critical facility could render the facility non-functional until decontamination or the threat has passed. For this reason, all critical facilities are assumed to be at risk from communicable disease and bioterrorism. As with any biological event, the hospitals and health service providers would most likely discover a threat and possibly become the first contaminated. This threat, however, when compared to the threat to the population and from other hazards is considered low.

Potential Losses

Potential losses from communicable disease and bioterrorism, in addition to the population (discussed in the next section), is to the economy. Human, animal, or plant diseases may all have a significant impact on the Deer Lodge County economy. A human quarantine or highly publicized event may affect sales and tourism in the community resulting in long term economic impacts. Animal or plant diseases nationwide could have an overarching effect on the national economy. More directly, however, Deer Lodge County has 109 farms totaling nearly 135,000 acres. In 2002, total cash receipts from agriculture were \$4,159,000 with \$3,324,000 from livestock sales. At the start of 2004, Deer Lodge County had 8,800 head of cattle and 1,200 sheep for agriculture purposes.¹⁶ This income and livestock could be lost in a severe animal disease outbreak.

¹⁶ Montana Agricultural Statistics Service, <http://www.nass.usda.gov/mt/>.

Potential Population Impacts

The entire Deer Lodge County population of 9,417 is at risk for contracting disease. The urban nature of Anaconda makes it more vulnerable to rapidly spreading and highly contagious diseases than more rural parts of the County. The state hospitals and facilities in Warm Springs and Galen have high density housing that could contribute a rapid spread of disease in those populations. Another contributing factor is the higher than average percentage of people over 65 years old in Deer Lodge County. Over 1,700 people or 18.8% of the population compared to the state average of 13.4% are over the age of 65. The number of fatalities in the County would depend on the mortality rate and the percentage of the population affected. The ability to control the spread of disease will be dependent on the contagiousness of the disease, movement of the population, and the warning time involved.

Impact of Future Development

Future development would not be directly impacted by communicable disease and bioterrorism, but any additional residents would be at risk for disease.

Data Limitations

Disease is a difficult hazard to provide specific vulnerabilities on. For a disease to have a major impact, it first has to enter the community and then spread. That starting point, how the disease progresses, and preventative actions taken will determine the eventual outcome. The data and analysis are limited by these outside factors.

DROUGHT

Description

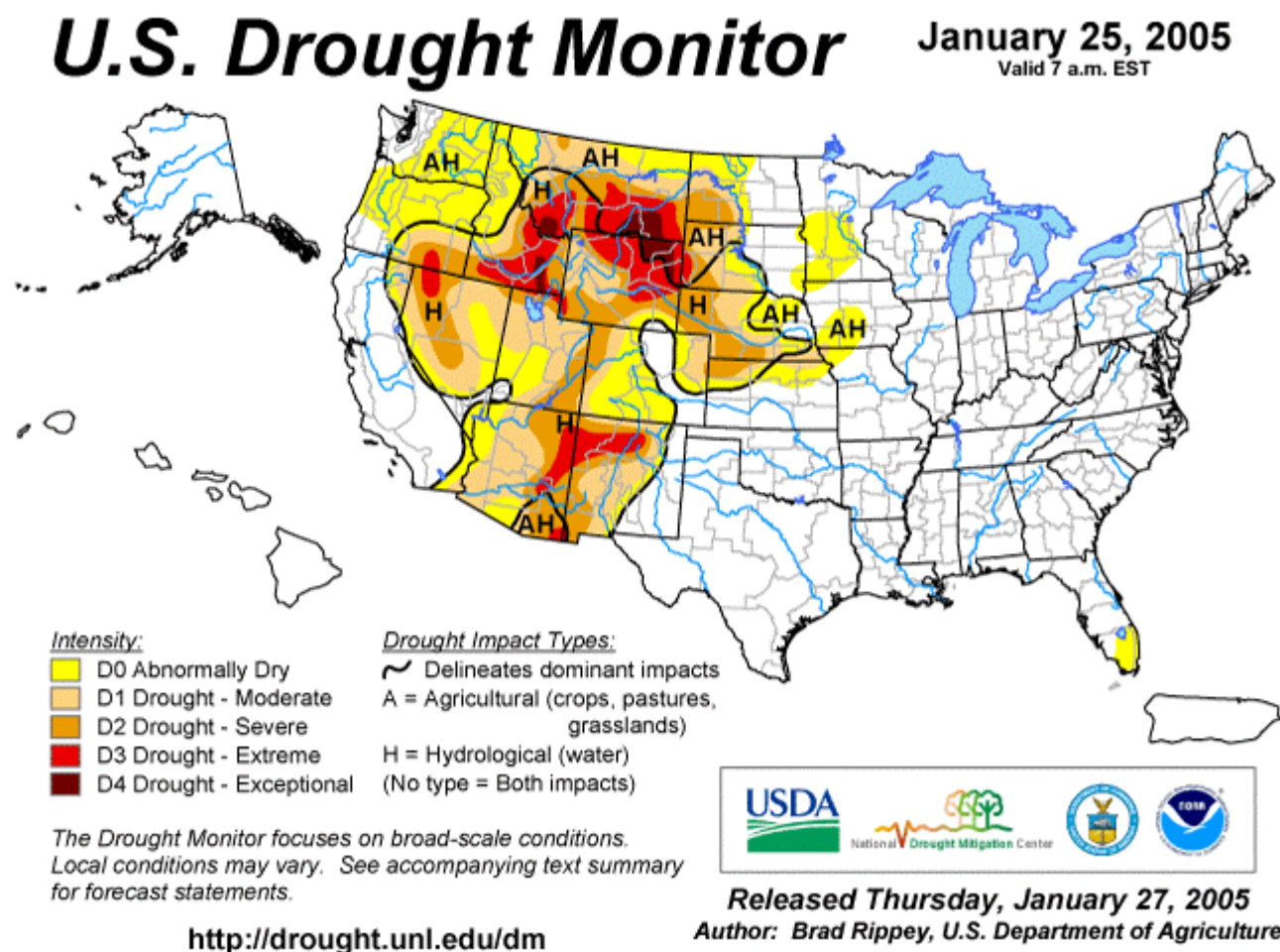
Drought is an insidious hazard of nature. Although it has scores of definitions, it originates from a deficiency of precipitation over an extended period of time, usually a season or more. This deficiency results in a water shortage for some activity, group, or environmental sector. Drought should be considered relative to some long-term average condition of balance between precipitation and evapotranspiration (i.e., evaporation + transpiration) in a particular area, a condition often perceived as “normal”. It is also related to the timing (i.e., principal season of occurrence, delays in the start of the rainy season, occurrence of rains in relation to principal crop growth stages) and the effectiveness (i.e., rainfall intensity, number of rainfall events) of the rains. Other climatic factors such as high temperature, high wind, and low relative humidity are often associated with it in many regions of the world and can significantly aggravate its severity.¹⁷

Droughts can range from minor to severe, short-term to long-term with a variety of determining factors such as precipitation, soil moisture, and tree moisture. A minor, short-term drought can slip by unnoticed while a long-term severe drought can impact the agricultural economy, natural resources such as fish populations, and even public water supplies. In Montana, drought conditions have also been associated with grasshopper infestations and blight.

Montana is known for its arid climate and Deer Lodge County is no exception. The region has been in drought for the past several years based on climate information, drought indices such as the Palmer Index, and drought monitoring at the national level. Figure 4.26 shows the drought status of the United States in January 2005. Note that Deer Lodge County is located in the “extreme” drought intensity. The State of Montana has a Drought Advisory Committee and a State Drought Plan in place to address this hazard. Historical weather records show that Anaconda temperatures can get as high as 100°F in the summer with extremely low humidities and high winds. Such dry, hot conditions exacerbate drought conditions during periods of low precipitation.

¹⁷ National Drought Mitigation Center, <http://www.drought.unl.edu/index.htm>.

Figure 4.26 National Drought Conditions as of January 2005



History

Drought has a long history in Deer Lodge County and all of Montana. Paleoclimate studies show extreme periods of drought hundreds of years ago. The periods of 200-370 A.D., 700-850 A.D., and 1000-1200 A.D. are identified as long-term periods of drought in the Northern Great Plains.¹⁸ In recent times, a more detailed weather monitoring network has developed, and climate records generally date back 100 years in Montana. Based on data from Montana Disaster and Emergency Services, Deer Lodge County has been in drought several times over the past decade. Table 4.27 identifies and describes these periods.

¹⁸ Montana Disaster and Emergency Services, State of Montana Multi-Hazard Mitigation Plan and Statewide Hazard Assessment, October 2004.

Table 4.27 Deer Lodge County Drought Periods since 1900⁸

Time Period	Description
1930's	The "Dust Bowl" created erosion problems and dust storms throughout the state.
1960's	Entire state affected, although the impact of this drought was lessened through better conservation practices such as crop stripping.
1970's	By May 1977, over 250,000 acres of Montana farmland was damaged by wind. The State of Montana began taking protective measures due to critically low hydroelectric power supplies.
1985	USDA drought disaster declaration. A typical 2,500 acre farm lost more than \$100,000 in equity. The state agriculture industry lost nearly \$3 billion in equity.
2000-present	Statewide drought disaster designations in 2000, 2001, and 2002. In 2004, Deer Lodge County, as a "contiguous" county, was given a USDA Secretarial Disaster Designation. Most protective measures are being conducted at the county level.

Probability

The National Oceanic and Atmospheric Administration Paleoclimatology Program has studied drought by analyzing records from tree rings, lake and dune sediments, archaeological remains, historical documents, and other environmental indicators to obtain a broader picture of the frequency of droughts in the United States. According to their research, "...paleoclimatic data suggest that droughts as severe as the 1950's drought have occurred in central North America several times a century over the past 300-400 years, and thus we should expect (and plan for) similar droughts in the future. The paleoclimatic record also indicates that droughts of a much greater duration than any in the 20th century have occurred in parts of North America as recently as 500 years ago."¹⁹ Based on this research, the 1950's drought situation could be expected approximately once every 50 years or a 20% chance every ten years. An extreme drought, worse than the 1930's "Dust Bowl" has an approximate probability of occurring once every 500 years or a 2% chance of occurring each decade.

Mapping

Drought is regional hazard, and therefore, mapping at the county level is not appropriate here. The county is assumed to have the same risk countywide. Mapping of the current drought status is published by the US Drought Monitor weekly and the Montana Drought Advisory Committee monthly from March through October.

¹⁹ National Climatic Data Center, Paleoclimatology Branch, <http://www.ngdc.noaa.gov/paleo/paleo.html>.

Associated Hazards and Other Factors

Drought is most commonly associated with wildfire in Deer Lodge County. Dry conditions contribute to lower moisture content in the trees and plants that provide fuel for wildfires. An initial look at the driest years show that they do not directly coincide with severe wildfire seasons, however, the effects of drought can carry into the long term. One season of severely low precipitation may not be enough for extreme fire behavior, however, followed by several seasons of below normal precipitation, the conditions can contribute to an increased probability for significant wildfires. Drought often kills trees and plants that then become very dry fuels for wildfires years later. Short-term drought conditions can prime grasses on non-irrigated lands for grass fires and long-term drought conditions can additionally impact the heavier timber fuels for forest fires.

Counter intuitively, in mountainous areas, such as Deer Lodge County, drought can quickly be followed by flash flooding. Dry soils are not as permeable to water, and therefore, heavy rains run off faster than on moist soils and can more easily lead to flash flooding.

Blight and grasshopper infestations have a greater probability of occurring in drought conditions. Besides the hydrologic and agricultural impacts, drought can also lead to severe duststorms and soil erosion affecting the population and non-agriculture economies. Additional concerns include the water temperatures for fish populations, hydroelectric power supplies, and public water sources.

Vulnerability

Critical Facilities

Generally, critical facilities are not affected directly by drought. Infrastructure relying on the water supply is the primary exception. If the water supply for public drinking water and sewer systems was threatened, those losses could total millions of dollars should equipment be damaged or outside water need to be shipped into the county. The probability of a drought of that significance is considered low.

Potential Losses

The most probable losses from drought are to the economy. Drought significantly impacts the agricultural economy and can additionally impact tourism. Deer Lodge County totaled over \$800,000 in crop sales during 2002. In comparison, the mid 1990's show annual crop sales totaling over \$2,000,000. Many factors may have caused the sharp decrease in sales but drought is most likely one of the leading reasons. Crops are very directly affected by drought and this current \$800,000 economy could potentially be lost if the drought worsens.

Crops aren't the only aspect of agriculture affected by drought. Livestock can also be impacted. The pasture and food supply available to the animals is directly related to drought conditions. With over \$3,000,000 in livestock sales in 2002, this larger agricultural economy is additionally threatened by drought.

Natural resources, and therefore tourism, are influenced by drought. As river and stream levels drop, fish populations and other natural resources are impacted. With fishing and river recreational activities

an important part of the tourism industry in Deer Lodge County, those aspects of the economy can be threatened during extended periods of drought.

Potential Population Impacts

Since drought evolves slowly over time, the population has ample time to prepare for its effects and is warned accordingly. The greatest direct threat to the population from drought is through the drinking water supply. Should a drought affect the water available for public water systems or individual wells, the availability of clean drinking water could be compromised. This situation would require emergency actions and could possibly overwhelm the local government and financial resources.

Impact of Future Development

Future development's greatest impact on the drought hazard would be through possibly limiting ground water resources. Fortunately, public systems, individual wells, and septic systems are carefully monitored and permitted by Montana Department of Environmental Quality. Therefore, the impact of future development with respect to drought is considered low.

Data Limitations

The greatest data limitation with drought is the inability to pinpoint the start and end of drought periods and the associated correlation with economic losses. An online database of historical USDA drought declarations and the associated losses would prove beneficial in documenting the effects of drought and directing mitigation activities.

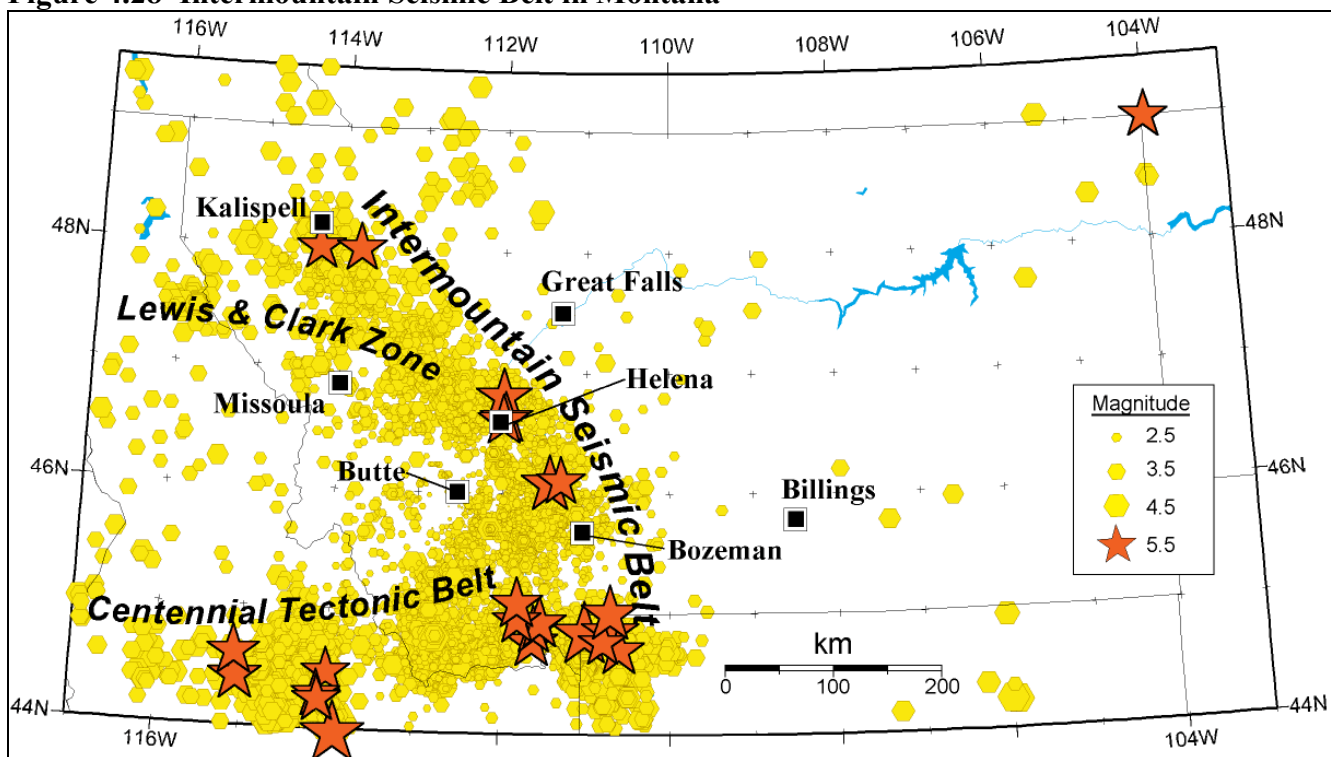
EARTHQUAKE

Description

One of the most frightening and destructive phenomena of nature is a severe earthquake and its terrible aftereffects. An earthquake is a sudden movement of the Earth, caused by the abrupt release of strain that has accumulated over a long time. For hundreds of millions of years, the forces of plate tectonics have shaped the Earth as the huge plates that form the Earth's surface slowly move over, under, and past each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy. When the accumulated energy grows strong enough, the plates break free. If the earthquake occurs in a populated area, it may cause many deaths and injuries and extensive property damage.²⁰

Montana is the eighth ranked state in the United States for earthquake occurrences and has many faults, primarily in the mountainous parts of the state. The Intermountain Seismic Belt, shown in Figure 4.28, demonstrates the active seismic areas in the state. Deer Lodge County lies just to the west of the most active areas and has been in close proximity to many significant earthquakes. Earthquakes can damage property and infrastructure very rapidly and significantly with little warning, severely impacting those close to the epicenter. Often, strong earthquakes can felt for hundreds of miles.

Figure 4.28 Intermountain Seismic Belt in Montana²¹



²⁰ US Geological Survey, <http://pubs.usgs.gov/gip/earthq1/intro.html>.

²¹ Montana Bureau of Mines and Geology, Earthquake Studies Office, http://mbmgquake.mtech.edu/interm_s_b.html.

History

Since 1900, six earthquakes of magnitude 5.5 or greater have occurred within 100 miles of Deer Lodge County. Table 4.29 shows the list of these earthquakes.

Table 4.29 Earthquakes Magnitude 5.5 or greater within 100 miles of Deer Lodge County²²

Date	Approximate Location	Magnitude
6/28/1925	Clarkston	6.6
2/16/1929	Lombard	5.6
10/12/1935	Helena	5.9
10/19/1935	Helena	6.3
10/31/1935	Helena	6.0
11/23/1947	Virginia City	6.1

The Clarkston earthquake in 1925 was felt in six distinct shocks in Anaconda. The first shock “shook buildings and caused occupants to flee in panic to streets.” Damage was confined to small and fragile items.²³ The 1929 Lombard earthquake was felt in Anaconda but the only damages were to dishes rattled off shelves.²⁴ The October 19, 1935 earthquake in Helena was felt in Anaconda and residents fled into the streets, but no damages were reported.²⁵ The Virginia City earthquake in 1947 was also felt in Deer Lodge County but no damages were reported.

The Hebgen Lake earthquake on August 18, 1959, the most significant earthquake to have occurred in Montana over the past 100 years, was located just over 100 miles from Anaconda. This magnitude 7.5 earthquake occurred to the southeast of Deer Lodge County near Yellowstone National Park. This surface rupturing earthquake changed the geology of the Hebgen Lake area and triggered a major landslide (80 million tons of rock). The result was the creation of a new lake, Earthquake Lake, on the Madison River, and State Highway 287 was buried. Twenty-eight people were killed and roadway and timber damages totaled over \$11 million. The quake was felt in 8 states and 3 Canadian provinces.²⁶ Residents of Anaconda felt the early morning earthquake and fled to the streets. Some chimneys in the area were loosened and foundations were cracked. Major damages were not reported in Anaconda, however.²⁷

Although greater than 100 miles away, the magnitude 7.3 Borah Peak earthquake near Challis, ID on October 28, 1983 was felt in Anaconda and a wall in the courthouse cracked. In addition, minor landslides on Mt. Haggin were triggered.²⁸

²² Stickney, Michael et al. Quaternary Faults and Seismicity in Western Montana. Montana Bureau of Mines and Geology Special Publication 114, 2000.

²³ Associated Press, June 27, 1925.

²⁴ Associated Press, February 15, 1929.

²⁵ Anaconda Leader, October 19, 1935.

²⁶ US Geological Survey, http://neic.usgs.gov/neis/states/montana/montana_history.html.

²⁷ Anaconda Leader, August 19, 1959.

²⁸ Anaconda Leader, October 1983.

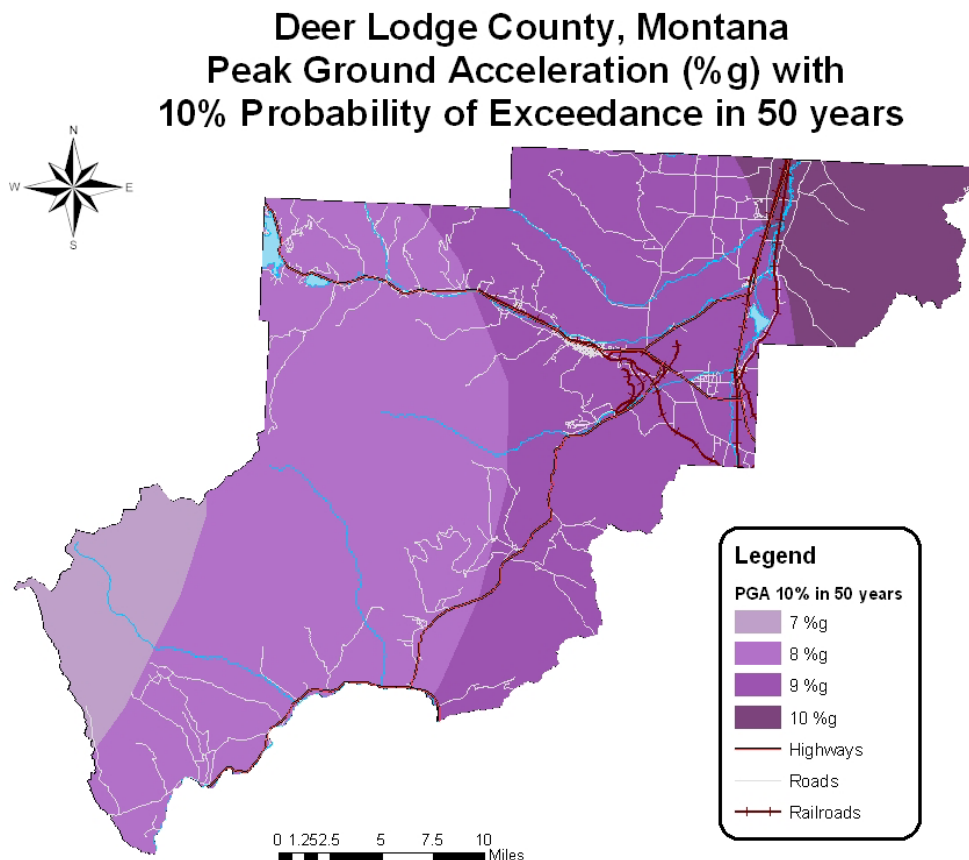
Probability

Earthquakes, when large and damaging, are infrequent events. Deer Lodge County regularly experiences small earthquakes, but they are undetectable except by instrumentation. The mapping section that follows outlines some of the probabilities used in earthquake modeling as it varies throughout the county. Depending on the earthquake magnitude, recurrence intervals for Western Montana are currently being developed. Deer Lodge County lies within the Northern Rocky Mountain seismic source zone. This region is estimated to have a recurrence rate of 36.6 years for a magnitude 5 or greater earthquake, 420 years for a magnitude 6 or greater earthquake, and 4,821 years for a magnitude 7 or greater earthquake.¹⁸ The areas to the east and south of Deer Lodge County, however, have much more frequent earthquake intervals.

Mapping

Research through the US Geological Survey's National Seismic Hazard Mapping Project has resulted in peak ground acceleration maps related to the probability of seismic shaking. The map for Deer Lodge County, Map 4.30, shows the strength of seismic shaking that has a 10% probability of being exceeded in a 50 year period. The strength of the shaking is measured as a percent of the acceleration of gravity (%g). As Map 4.30 shows, the earthquake hazard in Deer Lodge County is greater to the east.

Map 4.30 Peak Ground Acceleration (%g) with a 10% Probability of Exceedance in 50 Years



Data Source: US Geological Survey and Montana Bureau of Mines and Geology

June 2005

Deer Lodge County does not have any known active faults. History has shown that significant earthquakes (up to magnitude 6.5) may occur anywhere throughout the Intermountain Seismic Belt, even in areas where young faults are not recognized. Examples of damaging earthquakes for which no known surface fault was recognized include the 1925 Clarkston earthquake (magnitude 6.6) and the 1935 Helena earthquakes (magnitude 6.3-5.9).

Associated Hazards and Other Factors

The seismic action of earthquakes often triggers other events. Landslides are quite common in Montana with large earthquakes. During the winter, avalanches can also be triggered. Dam breaks and landslides on waterways may cause flooding. The rupture of gas lines can result in large scale urban fires, particularly if power outages or broken water mains disrupt water supplies. Any number of additional incidents may occur due to the failure of infrastructure such as hazardous material spills, communications failure, and large scale transportation accidents. All of these associated factors contribute to the severity of the earthquake event.

Vulnerability

Critical Facilities

Most of the County has comparable seismic risk based on the peak ground acceleration probabilities. Based on this, all of the critical facilities and vulnerable populations are considered to have the same probability for seismic shaking. A detailed study of each of the critical facilities would need to be conducted to determine the specific vulnerability to that structure and the likelihood and magnitude of damages. The HAZUS loss estimation model results presented in the Potential Losses section does specify the functionality of certain critical facilities contained in the model database.

Potential Losses

Earthquake damages can be difficult to predict and assess without detailed structure information or a damage model. Fortunately, the Federal Emergency Management Agency has developed loss estimate software for earthquakes (HAZUS). This model uses national databases to estimate the earthquake losses from a particular event at the census block, tract, or county level. Although the default data provided with the model is far from accurate, the model provides a general estimate of what earthquake losses may occur and the magnitude of such. Should Deer Lodge County decide to import more accurate data, the results will be significantly improved. The results from a default, level 1 run through the model follows.

HAZUS has an inventory of 4,092 structures and is known to overestimate the structure replacement values for this area. Despite this, two simulations were run through the model for 100-year and 500-year events.

100-year Earthquake in Deer Lodge County

- Structure Damages:
 - Complete: 0 structures
 - Extensive: 5 structures
 - Moderate: 65 structures
 - Slight: 269 structures
- Losses from capital stock (structural, non-structural, contents, and inventory) and income (relocation, capital related, wages, and rental income): \$3,901,000
- Montana State Hospital functionality: 91%
- Anaconda Community Hospital functionality: 93%
- Anaconda-Deer Lodge Courthouse functionality: 93%
- Schools functionality: 94%
- Bridges: Minimal damages totaling roughly \$25,000
- Utilities: Minimal damages totaling roughly \$2,000
- Casualties: 1

500-year Earthquake in Deer Lodge County

- Structure Damages:
 - Complete: 3 structures
 - Extensive: 41 structures
 - Moderate: 259 structures
 - Slight: 730 structures
- Losses from capital stock (structural, non-structural, contents, and inventory) and income (relocation, capital related, wages, and rental income): \$19,188,000
- Montana State Hospital functionality: 59%
- Anaconda Community Hospital functionality: 64%
- Anaconda-Deer Lodge Courthouse functionality: 79%
- Schools functionality: 79%
- Bridges: 95% functional with damages totaling roughly \$398,000
- Utilities: Minimal damages totaling roughly \$10,000
- Casualties: 6
- Debris Generated: 8,000 tons

These results from HAZUS could potentially be more accurate and informative if better data was developed and used in the analysis. Many structures, including critical facilities, within Deer Lodge County have not been seismically assessed. As the 2000 US Census data indicates, over 90% of residences were constructed prior to 1980 and over 37% of residences were constructed prior to 1940. Many of the existing homes, businesses, and critical facilities may not be structured to withstand seismic shaking.

Potential Population Impacts

The population would have little or mostly likely no warning prior to an earthquake. Most casualties in a large earthquake in Deer Lodge County would be anticipated with building collapse, roadway failures, falling objects, and landslides. As the HAZUS runs show, less than 10 casualties could be expected in a 500 year period.

Impact of Future Development

Any future development in Deer Lodge County is at risk for earthquake damages. Fortunately, construction standards for seismic stability have improved over the past 100 years. Anaconda-Deer Lodge County does enforce local building codes through a county building inspector. Without any known faults in the county, development occurs without regard to specific earthquake hazard areas.

Data Limitations

Since earthquakes are a relatively rare event, perhaps the greatest challenge is understanding the true probability and damages possible. More research is needed in identifying fault areas and developing digital data for use in the HAZUS modules. Improving the modeling and assessing individual facilities will allow for a more accurate vulnerability assessment.

FLOODING – DAM FAILURE

Description

Dams have been placed around Montana for many reasons including recreation, flood control, irrigation, water supply, hydroelectricity, and mining. Dams are built and owned by a variety of entities such as private individuals, businesses, and government. They also come in all shapes and sizes from small earthen dams to large concrete structures. The structural integrity of a dam depends on its design, maintenance, and weather/drainage situation. Problems arise when a dam fails and people and/or property lie in its inundation area. Dams can fail for a variety of reasons including poor maintenance, overwhelming weather and flow conditions, or by an intentional act. Dam failure can be compared to riverine or flash flooding in the area downstream from the dam, and sometimes for long distances from the dam, depending on the amount of water retained and the drainage area. Other dams may be located in areas that result in little if any damages during a failure.

Hazard ratings are given to dams for emergency management planning purposes. These ratings, high, significant, and low, are based on the potential for loss of life and property damage from the failure of the dam, not the condition or probability of the dam failing. Definitions, as accepted by the Interagency Committee on Dam Safety, are as follows:

Low Hazard Potential

Dams assigned the low hazard potential classification are those where failure or misoperation results in no probable loss of human life and low economic and/or environmental losses. Losses are principally limited to the owner's property.

Significant Hazard Potential

Dams assigned the significant hazard potential classification are those dams where failure or misoperation results in no probable loss of human life but can cause economic loss, environment damage, disruption of lifeline facilities, or impact other concerns. Significant hazard potential classification dams are often located in predominantly rural or agricultural areas but could be located in areas with population and significant infrastructure.

High Hazard Potential

Dams assigned the high hazard potential classification are those where failure or misoperation will probably cause loss of human life.

Deer Lodge County has five high hazard dams, one significant hazard dam, and six low hazard dams as shown in Table 4.31.

Table 4.31 Dams in Deer Lodge County, Montana²⁹

Dam Name	River	NID Height (feet)	NID Storage (acre-ft)	Drainage Area (sq. mi)	Year Finished	Hazard	Owner
Silver Lake West	Georgetown Lake Tributary	17	17,920	1.9	1918	High	Butte-Silver Bow
Storm Lake	Storm Lake Creek	29	2,150	1.9	1898	High	Butte-Silver Bow
Warm Springs Tailing #1	Silver Bow Creek	15	1,950	450	1911	High	Atlantic Richfield Company
Warm Springs Tailing #2	Silver Bow Creek	21	1,650	450	1919	High	Atlantic Richfield Company
Warm Springs Tailing #3	Silver Bow Creek	35	6,200	450	1959	High	Atlantic Richfield Company
Opportunity Tailings Pond	Silver Bow Creek, Offstream	37	9,230		1962	Significant	Atlantic Richfield Company
Babcock	Lost Creek Tributary	15	93		1953	Low	Loubren, Inc.
Heapby Reservoir	Modesty Creek	15	62		1958	Low	Donald W. Beck
Hearst Lake	Grays Gulch	9	140		1898	Low	Butte-Silver Bow
Meyer's Dam	Warm Springs Creek	25	26		1902	Low	Atlantic Richfield Company
Silver Lake East	Storm Lake Creek Tributary	11	17,920	1.9	1918	Low	Butte-Silver Bow
Thornton Lake	Thornton Creek	7	122		1904	Low	Donald W. Beck

History

In July 1938, the “City Reservoir” broke near Warm Springs and resulted in rescues and an inundation area of twenty-two blocks wide by four blocks long.³⁰ Although not a dam, residents recalled a water flume break in the 1970’s that flooded Anaconda.

Probability

The probability of dam failure in Deer Lodge County is considered low. Tailings ponds and high or significant hazard dams are the most probable to cause damages and none are known to be unstable. The Montana Department of Natural Resources keeps an assessment of dams not meeting safety standards and none are located in Deer Lodge County. Therefore, Deer Lodge County has the possibility of a significant dam break but the probability is considered low.

Mapping

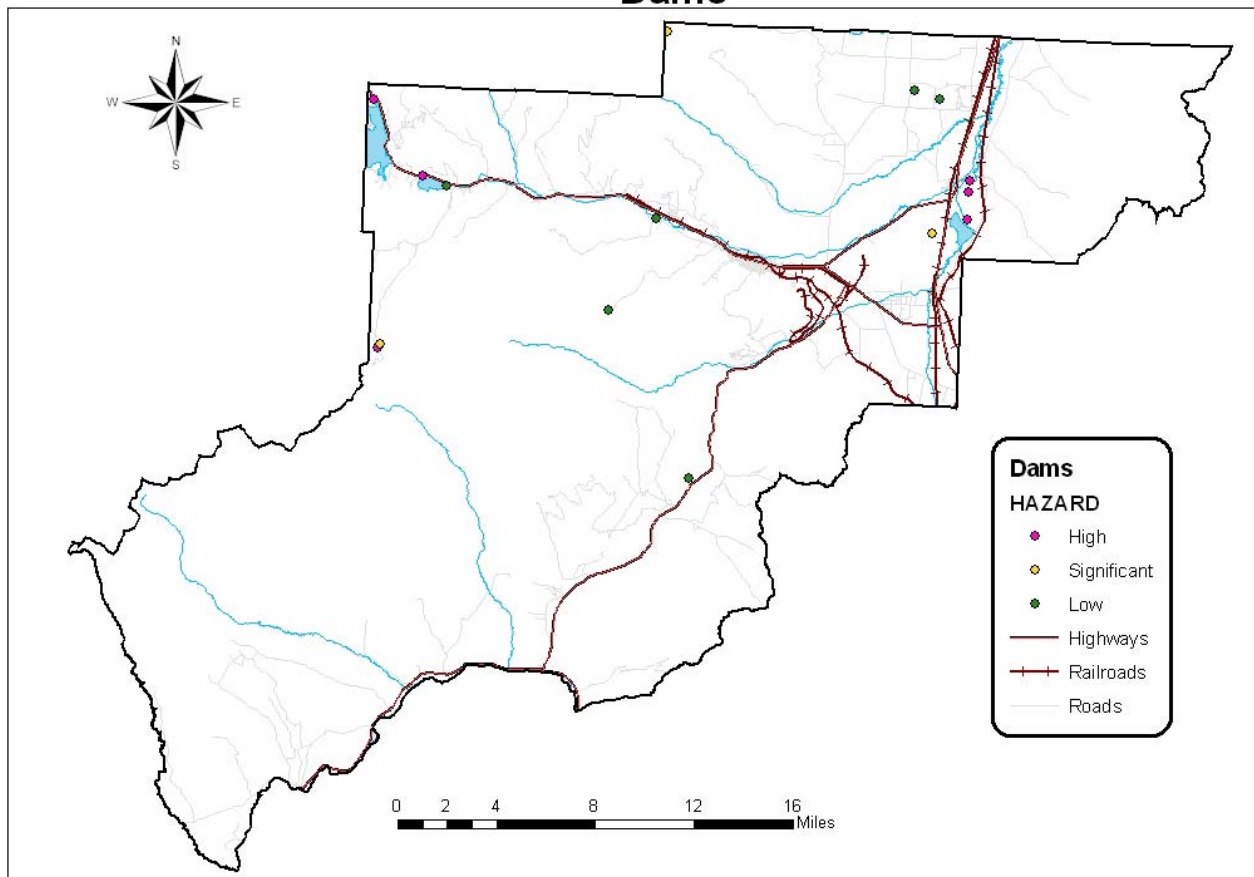
The locations and hazard assignment of dams in Deer Lodge County can be found on Map 4.32.

²⁹ National Inventory of Dams, <http://crunch.tec.army.mil/nid/webpages/nid.cfm>.

³⁰ Anaconda Leader, July 1938.

Map 4.32

Deer Lodge County, Montana Dams



Data Source: US Army Corps of Engineers, National Inventory of Dams

Inundation mapping for the four high hazard dams exist in their Emergency Dam Plans. Copies of these plans are kept by the Anaconda-Deer Lodge County Disaster and Emergency Services Coordinator.

The Silver Lake West hazard area extends from Silver Lake West Dam to Georgetown Lake. Based on the inundation maps, seven residences plus residences on Denton's Point Road could be flooded by a dam break.

The Storm Lake Dam hazard area extends downstream from Storm Lake north along the Storm Lake Creek drainage and then northeasterly to the confluence of the Silver Lake East discharge channel. From there, the hazard area continues easterly, passing under Highway 10A into Cable Meadows where it joins Cable Creek. From Cable Meadows, the inundation area passes under the highway again and follows along the southern edge of Highway 1 easterly toward West Valley and Anaconda, passing under the highway three more times before reaching Anaconda. The Storm Lake Dam inundation areas are projected to affect Camp Silvercloud, the Spring Hill Picnic Area, and along Warm Springs Creek with a width from Stumptown Road to Highway 1. Once in Anaconda, the inundation area

extends north of Commercial Avenue. The inundation area tapers to 100-year floodplain levels by Galen Road.³¹

The Warm Springs Ponds Emergency Action Plan defines the hazard area as follows.

*For the clear weather breach, the inundation/evacuation area extends 39.5 miles downstream of the Warm Springs Ponds along the Clark Fork River valley to a point approximately 2 miles downstream of Goldcreek at which point the breach discharge is equivalent to the 100-year discharge. Under the design flooding conditions, the inundation/evacuation area extends 27 miles downstream of the Warm Springs Ponds to a point approximately 1.3 upstream from Garrison at which point the discharge resulting from the breach flood is equivalent to the design flood discharge.*³²

Seventeen residences in Deer Lodge County are in the inundation area of the Warm Springs Ponds.

Associated Hazards and Other Factors

Dam failure is most often associated with other hazards. Rarely do dams just crumble and break without some other underlying cause. Heavy rainfall or high water levels from rapid snowmelt are typically a contributing factor in a dam failure. In this scenario, flooding may already be occurring, and a dam break would aggravate the situation. Dams can also fail during a significant earthquake. Dam failure as a terrorist act has also been proposed by many agencies evaluating our homeland security. The dams in Deer Lodge County have very little security in place.

Vulnerability

Critical Facilities

A Storm Lake Dam storm induced breach would start to impact critical facilities upon reaching Anaconda. Those facilities that could expect to be affected include:

- DNRC/State Lands Office
- Anaconda-Deer Lodge Well Houses
- Dwyer Intermediate School
- LDS Church
- Hope Lutheran Church
- BAP Rail Yards
- Anaconda Community Hospital
- Anaconda Fire Station
- Anaconda Catholic Community Center
- Anaconda-Deer Lodge Water Department
- Metcalf Senior Citizen Center

³¹ Butte-Silver Bow, Department of Public Works, Water Utility Division, Emergency Action Plan, Silver Lake West Dam, Storm Lake Dam, November 2003.

³² Atlantic Richfield Company, Warm Springs Ponds, Operations and Maintenance Plan, Emergency Action Plan, December 2003, p. 10-25.

A break on the Warm Springs Ponds could be expected to impact the Montana State Hospital before inundating Deer Lodge in neighboring Powell County. None would be affected by a Silver Lake West break. Therefore, the Storm Lake Dam has the greatest potential to impact critical facilities.

Potential Losses

The Storm Lake Dam has the highest damage potential in Deer Lodge County. A storm induced breach would affect Camp Silvercloud, the Spring Hill Picnic Area, South of Highway 1, West Valley, and North Anaconda.³¹ Within the storm induced breach inundation area are roughly of 219 structures valued at \$8.7 million. These figures lead to the following loss estimates for planning purposes:

- 219 structures are estimated in or near the inundation area with a total estimated structure value exposure of \$8,700,000.
- In most cases, many of the structures would only have moderate, minor, or no damage, and some may not even lie within the inundation area due to the methodology used, so an estimate of 30% is used as the damage factor.
- \$8,700,000 total estimated structure value x 30% damage factor = \$2,610,000 estimated structure losses.

Seventeen Deer Lodge County owners are listed in the Emergency Notification Phone List for the Warm Springs Ponds.³² This indicates at least 17 structures are at risk from a dam failure within the county. For a dam break at the Warm Springs Ponds:

- 17 structures estimated in the flood inundation area x \$70,700 median home value obtained from US Census data = \$1,201,900 total estimated structure value exposure
- In most cases, many of the structures would only have moderate, minor, or no damage, so an estimate of 30% is used as the damage factor
- \$1,201,900 total estimated structure value x 30% damage factor = \$360,570 estimated structure loss

Potential Population Impacts

With any flooding or dam failure event, the loss of life is always possible. A dam break can happen rapidly and would most threaten those within close proximity of the dam. Once the break is recognized, however, those downstream can be warned and evacuated. In the case of the Storm Lake Dam, an estimated 416 people live in the dam inundation area (219 structures x 1.9 people/structure). Most of those people reside in the Anaconda area and would have about 5 hours to evacuate from the time the dam broke until the peak flow arrived in a storm induced event. Of greater concern would be the Camp Silvercloud area which has only about 45 minutes. The Yankee Flats area would see peak flow in about 2.5 hours.

The Silver Lake West Dam breach would reach Georgetown Lake in about 1 hour, and therefore, a rapid evacuation would need to occur for those in the inundation area. Depending on the time of day and season, the population in that area could greatly vary.

The population impacts from a break at the Warm Springs Ponds would not only affect the resident and working population in that area, but the containments released from the treatment ponds would be an additional hazard. Approximately 32 people (17 structures x 1.9 people/structure) live in the

inundation area. Since the potential for loss of life exists from all the high hazard dams, the potential population impacts are considered moderate.

Impact of Future Development

With the exception of the Georgetown Lake area, most of the development in Deer Lodge County is not occurring in the dam inundation areas. Those inundation areas of Silver Lake West and just downstream from Storm Lake do have an increased probability of future development based on current trends. Should development continue to occur in those areas, the structures, infrastructure, and population at risk would increase, particularly in the short warning time areas. Currently, the development permit system and subdivision regulations do not consider dam inundation areas.

Data Limitations

Readily available digital data outlining the inundation areas of high hazard dams would allow for a slightly more detailed analysis of potential losses and mapping in this plan. Otherwise, the analysis and mapping of the dam hazard are thoroughly outlined in the individual Emergency Action Plans. All of the dams in Deer Lodge County meet state dam safety standards, however, more detailed studies on the probability of a dam failure, including the possibility of a seismically induced break, would benefit this overview.

FLOODING – RIVERINE and FLASH

Description

Flooding is the inundation of a normally dry area with water. Riverine flooding occurs on rivers, creeks, and streams as water levels rise be it from excessive precipitation, rapid snowmelt, dam failure, or ice jams. Unlike riverine flooding, flash flooding can happen anywhere. As the name implies, flash flooding happens quickly after intense rains, dam or ice jam breaks, or rapid runoff in mountainous or recently burned areas. Urban flooding is the result of development and the ground's decreased ability to absorb the rainfall. Flooding from groundwater does not typically result in floodwaters at the surface, but occasionally basements and crawlspaces can be flooded by excessive groundwater.

Flooding is different from most other hazards in that riverine flooding problems are managed through a national insurance system called the National Flood Insurance Program (NFIP) under the Federal Emergency Management Agency (FEMA). FEMA conducts a Flood Insurance Study (FIS) of a region to identify the community's risk levels. The FIS includes statistical data for river flow, rainfall, topographic surveys, as well as hydrologic and hydraulic analyses. After examining the FIS data, FEMA creates Flood Insurance Rate Maps (FIRMs) delineating the different areas of flood risk. Land areas that are at high risk for flooding are called Special Flood Hazard Areas (SFHAs), or floodplains.³³ These maps are certainly not all inclusive and other flood prone areas may exist. The FIS and FIRM maps for Deer Lodge County were last updated in 1985. A digital, inexact version of the flood mapping termed Q3 data showing the SFHAs can be found in Maps 4.33 through 4.40.

The SFHAs can be categorized into 100- and 500-year floodplains. A 100-year floodplain has a 1% chance of being exceeded in any given year. Development in the 100-year floodplain must meet floodplain construction requirements adopted by Anaconda-Deer Lodge County and borrowers must purchase flood insurance. The 500-year floodplain includes the 100-year floodplain plus the areas that would be flooded during a larger, 500-year event. Development is currently not restricted in the 500-year floodplain, but damaging floods are certainly possible in these areas.

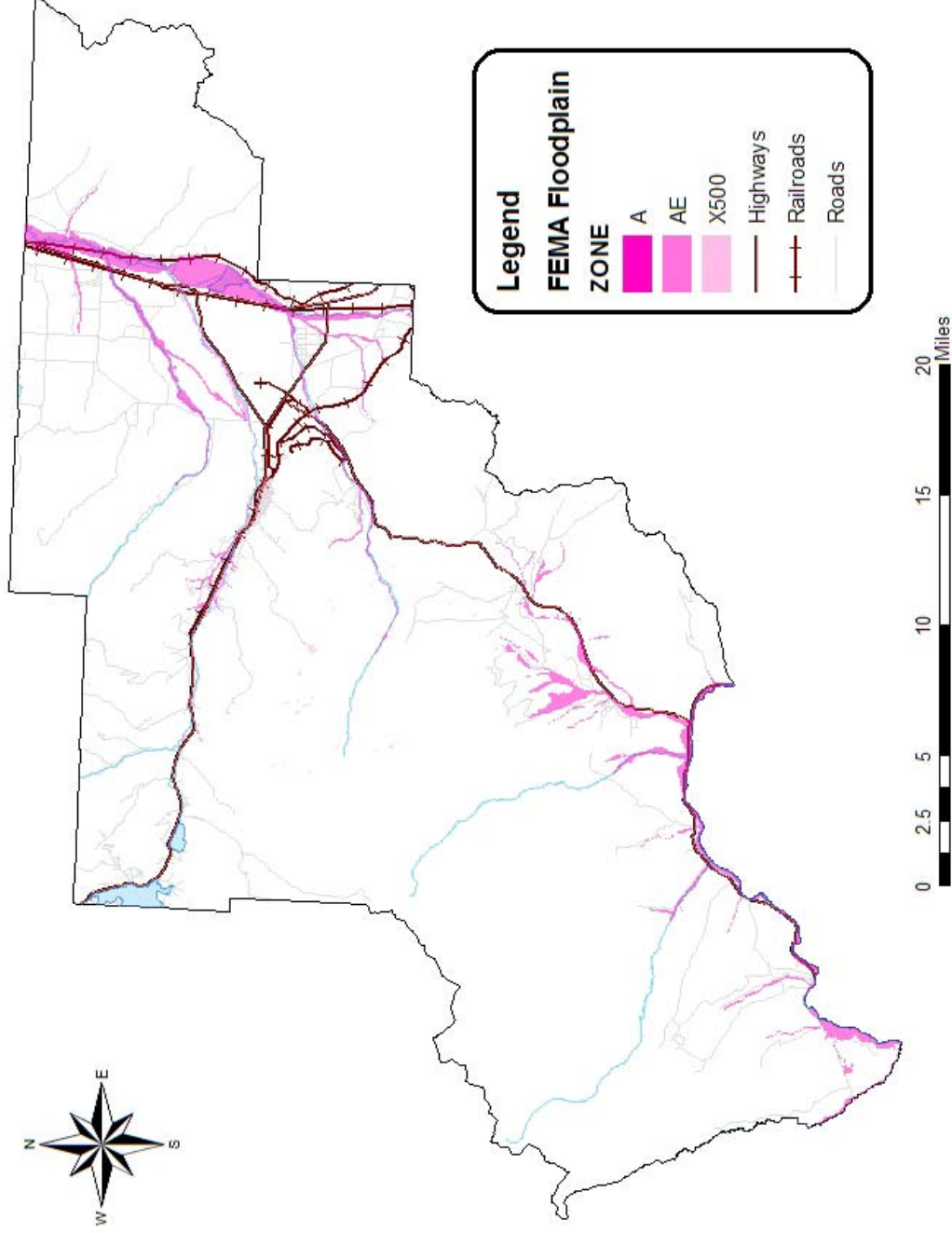
Flooding in Deer Lodge County normally occurs during periods of excessive rainfall or snowmelt. The mountainous terrain in Deer Lodge County is a contributing factor in flash flood and rapid snowmelt problems. Deer Lodge County has many creeks and streams including Warm Springs Creek and Silver Bow Creek and serves as the headwaters for the Clark Fork River. The Big Hole River forms part of the southern county line. The FEMA Flood Insurance Study analyzed 23.5 miles of Warm Springs Creek from its confluence with the Clark Fork River, one mile east of Warm Springs to the Beaverhead-Deerlodge National Forest, ten miles west of Anaconda. The Warm Springs Creek headwaters are in the Flint Creek and Anaconda Mountain Ranges. The study determined that Anaconda sits on an alluvial fan and generally floods from gulches on the southern end of the city, namely the Sheep, Glover, Fifer, and three smaller gulches. Typically, the Sheep Gulch floods onto Oak Street, Glover Gulch onto Poplar Street, and Fifer Gulch onto Evergreen Street. The smaller gulches flood onto Birch, Larch, and Spruce Streets. The flooding from these gulches generally results in shallow street, basement, and first floor flooding of downtown Anaconda. According to the study, railroad fill on the north and east end of Anaconda acts as a dam and does not allow the runoff to drain into Warm Springs Creek.³⁴

³³ Federal Emergency Management Agency, National Flood Insurance Program, www.floodsmart.gov.

³⁴ Federal Emergency Management Agency, Anaconda-Deer Lodge County Unincorporated Areas, Flood Insurance Study, December 18, 1985.

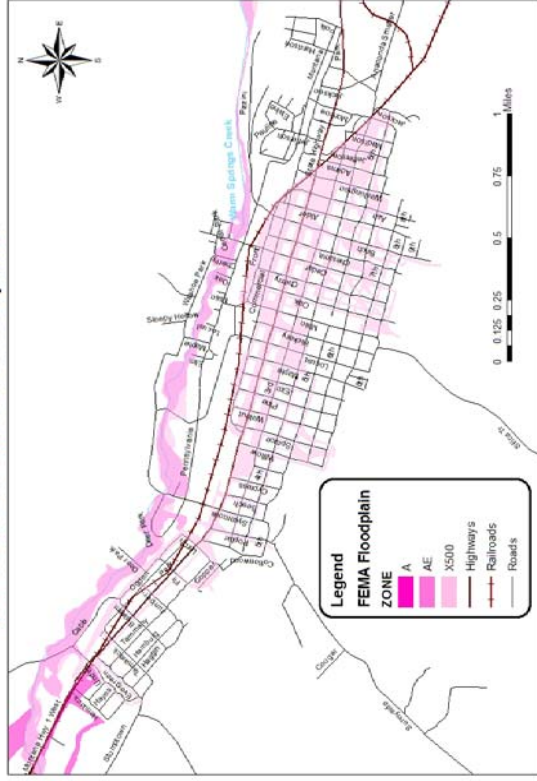
Map 4.33

Deer Lodge County, Montana 100 Year and 500 Year Floodplains



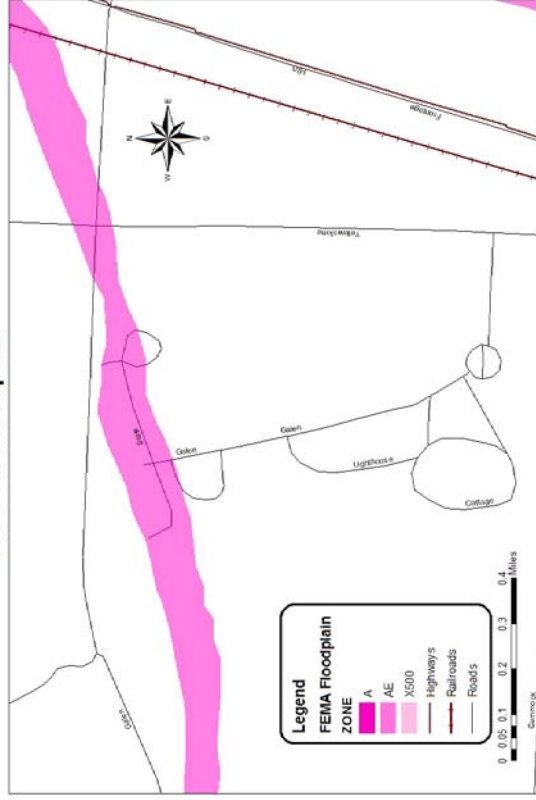
Map 4.34

Anaconda, Montana
100 Year and 500 Year Floodplains



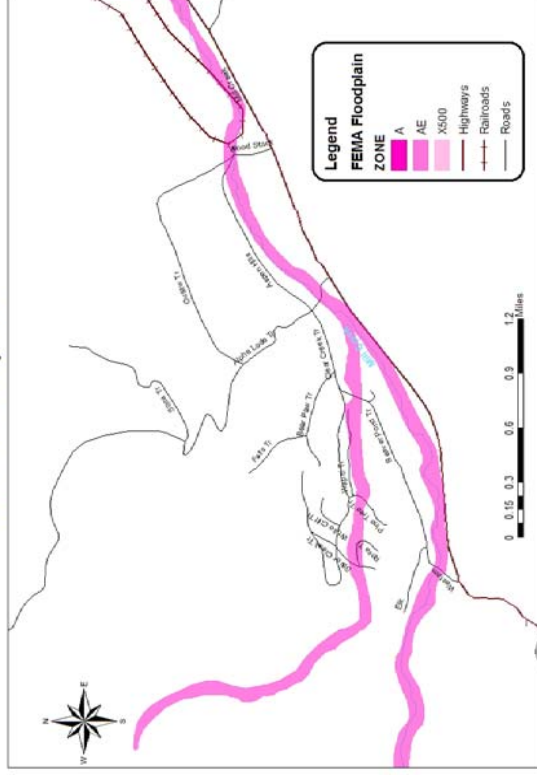
Map 4.36

Galen, Montana
100 Year Floodplain



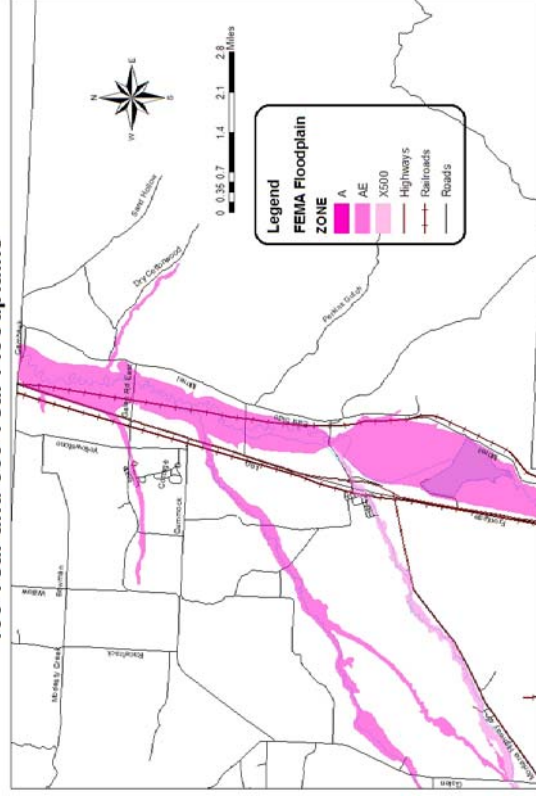
Map 4.35

Aspen Hills/Clear Creek
100 Year Floodplain



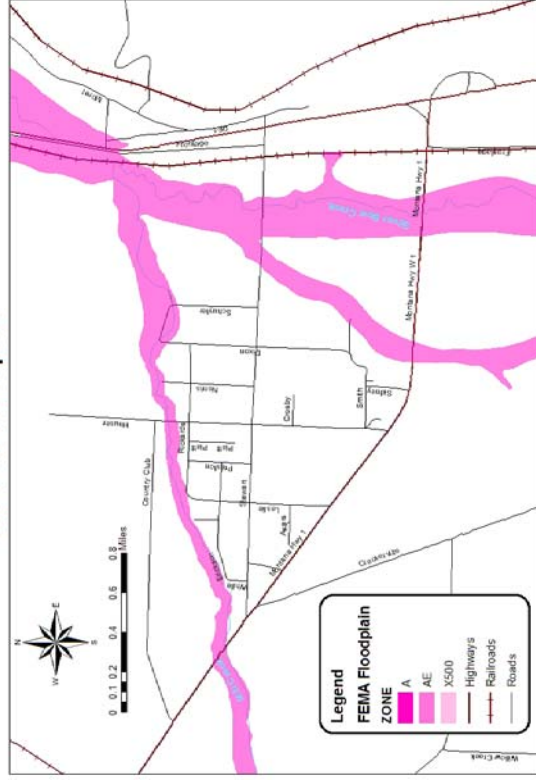
Map 4.37

Northeast Deer Lodge County, Montana
100 Year and 500 Year Floodplains



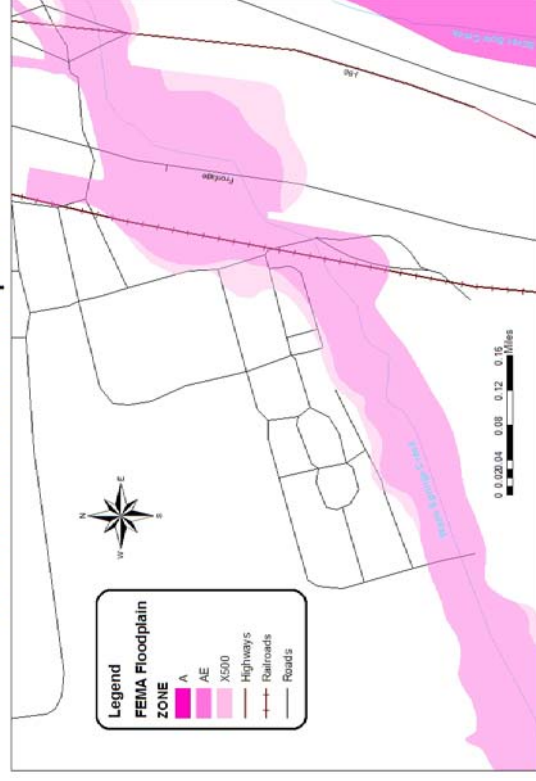
Map 4.38

Opportunity, Montana
100 Year Floodplain



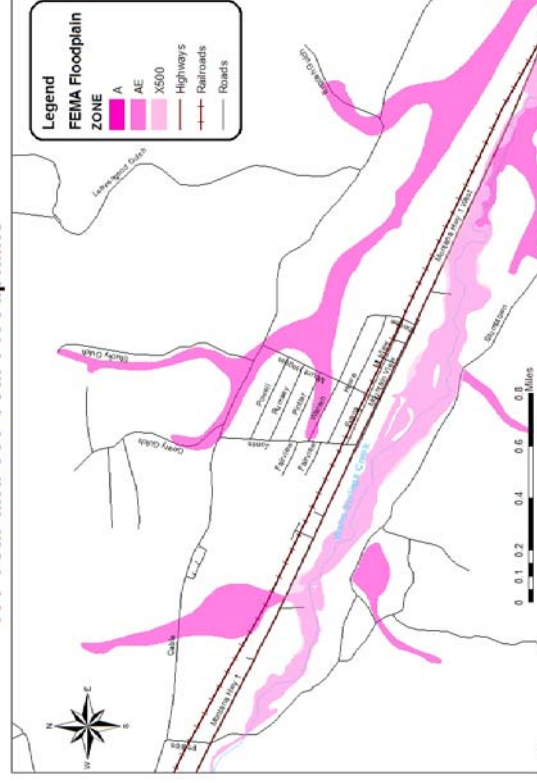
Map 4.39

Warm Springs, Montana
100 Year and 500 Year Floodplains



Map 4.40

West Valley, Montana
100 Year and 500 Year Floodplains



The Flood Insurance Study outlined the peak discharges for Warm Springs Creek shown in Table 4.41 for the various recurrence intervals.

Table 4.41 Warm Springs Creek Peak Discharges³⁴

Flooding Source and Location	Peak Discharges by Recurrence Interval			
	10-year	50-year	100-year	500-year
Upstream of confluence with Clark Fork	870 cfs	1,250 cfs	1,430 cfs	1,865 cfs
Upstream of North Cable Road	785 cfs	1,130 cfs	1,295 cfs	1,680 cfs
Downstream of Warm Springs Creek Road	270 cfs	390 cfs	445 cfs	575 cfs

History

Deer Lodge County has a long history of flooding. The historical record doesn't begin to fully outline the flood events until the mid 1970's. Previous events have been noted, dating all the way back to 1890, but the detailed loss estimates for these events are limited. Newspaper reports recount a flash flood near Sheep Gulch that resulted in road washouts on July 1, 1890. The FEMA Flood Insurance Study also notes damaging discharges on Warm Springs Creek in 1948, 1958, 1965, and 1967. In January 1974, a rapid snowmelt and rain event resulted in significant Anaconda urban and Warm Springs Creek flooding, also considered a damaging discharge. Mill Creek was noted at full capacity. Stores were sandbagged throughout the Anaconda downtown area and the President declared the area a disaster.

The mid 1980's proved to be particularly flood prone. Residents recalled that on June 17, 1984, three bridges were washed out when Warm Springs Creek flooded. During the February 1986, rapid snowmelt resulted in damages in several parts of the county. In Galen, a road near the state hospital was washed out and the wastewater treatment plant was inoperable. Meyers and Morrel Junction county roads were both washed out. Flooding problems were noted in the residential areas of West Valley on Rumsey, Warren, and Powell Streets, in Opportunity, and in Crackerville. Two homes were flooded with six inches to a foot on the first floor. A water boil order was in effect for West Valley, Lost Creek, and Opportunity due to contamination concerns. Deer Lodge County was declared a federal disaster area by the President on March 15, 1986. Recent mitigation work has upgraded culverts in the West Valley area.

In June 1995, Warm Springs Creek flooded as noted by local residents, but not to the significance in the two years that followed. From February 6 through 9, 1996, rapid snowmelt led to the loss of headgates, bridges, ditches, canals, and fences. Debris was washed into agricultural fields. East Side Road was severely damaged. On February 23, 1996, the President declared a federal disaster, including Deer Lodge County (FEMA-1105-DR-MT). Anaconda-Deer Lodge County received from the federal government \$9,767 for emergency protective measures and \$15,759 for road, culvert, and ditch repairs. The total losses far exceeded those figures.

The following winter of 1996/97 left a significant snow pack in the mountains and valleys of Deer Lodge County. On March 18, 1997, the county issued a pre-event disaster declaration (Resolution #472) in anticipation of flooding problems. Then during May and June, flooding caused severe

damage to roads and bridges. In particular, thunderstorm rains on June 14, 1997, caused flooding of low lying areas, washed out several culverts, and closed Hauser Avenue in Anaconda. The county declared a disaster on June 17, 1997 (Resolution #490), and on July 25, 1997, the President declared a disaster in Deer Lodge County (FEMA-1183-DR-MT).

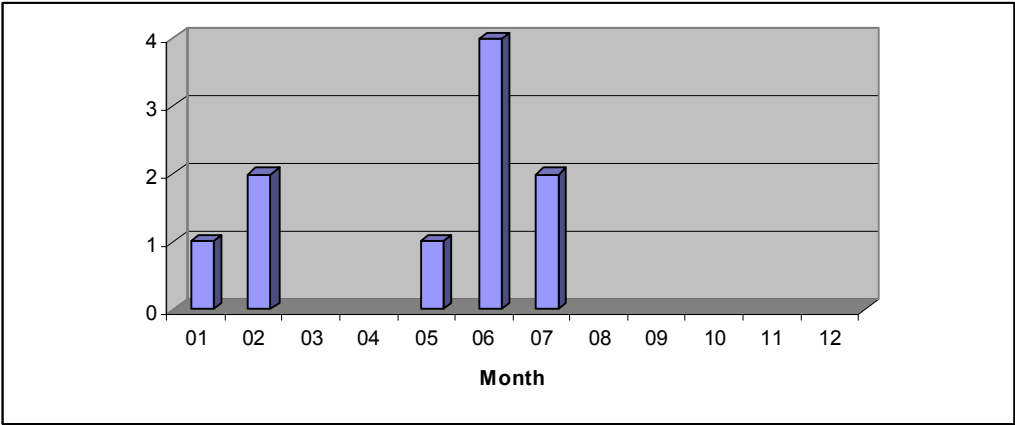
On July 19, 2002, a strong thunderstorm dumped heavy rain which flooded an area just west of Anaconda. Based on National Weather Service records, reports were received from the media and law enforcement of flash flooding causing water two feet deep to flood several buildings around the 1880's Ranch on North Cable Road. Mud and tree branches and stumps were reported flowing through the ranch, with water flooding North Cable Road. Five buildings were flooded with six to eight inches of mud. Part of a garage foundation was washed away when water came down the hill at roughly nine inches deep and about twice the width of the structure.

According to a local meteorologist, Warm Springs Creek flooded Washoe Park and parts of the area were evacuated during June 2003. Based on the historical record the conclusion can be made that major flooding on Warm Springs Creek usually comes from rain combined with heavy snowmelt in winter and spring and heavy rainstorms during the summer.

Probability

Flooding probabilities are shown through the mapping of the floodplain (see Maps 4.33 through 4.40). The 100-year floodplain has a 1% probability of being exceeded in any given year. The 500-year floodplain has a 0.2% probability of being exceeded in any given year. Flooding or damaging discharges have been noted in every decade since the 1940's in Deer Lodge County, some decades with more than one event. Recent drought years may have taken an emphasis off flooding concerns, but the probability remains that some degree of flooding can be expected once every decade. Figure 4.42 shows the months when flooding events have occurred.

Figure 4.42 Deer Lodge County Flood Events By Month

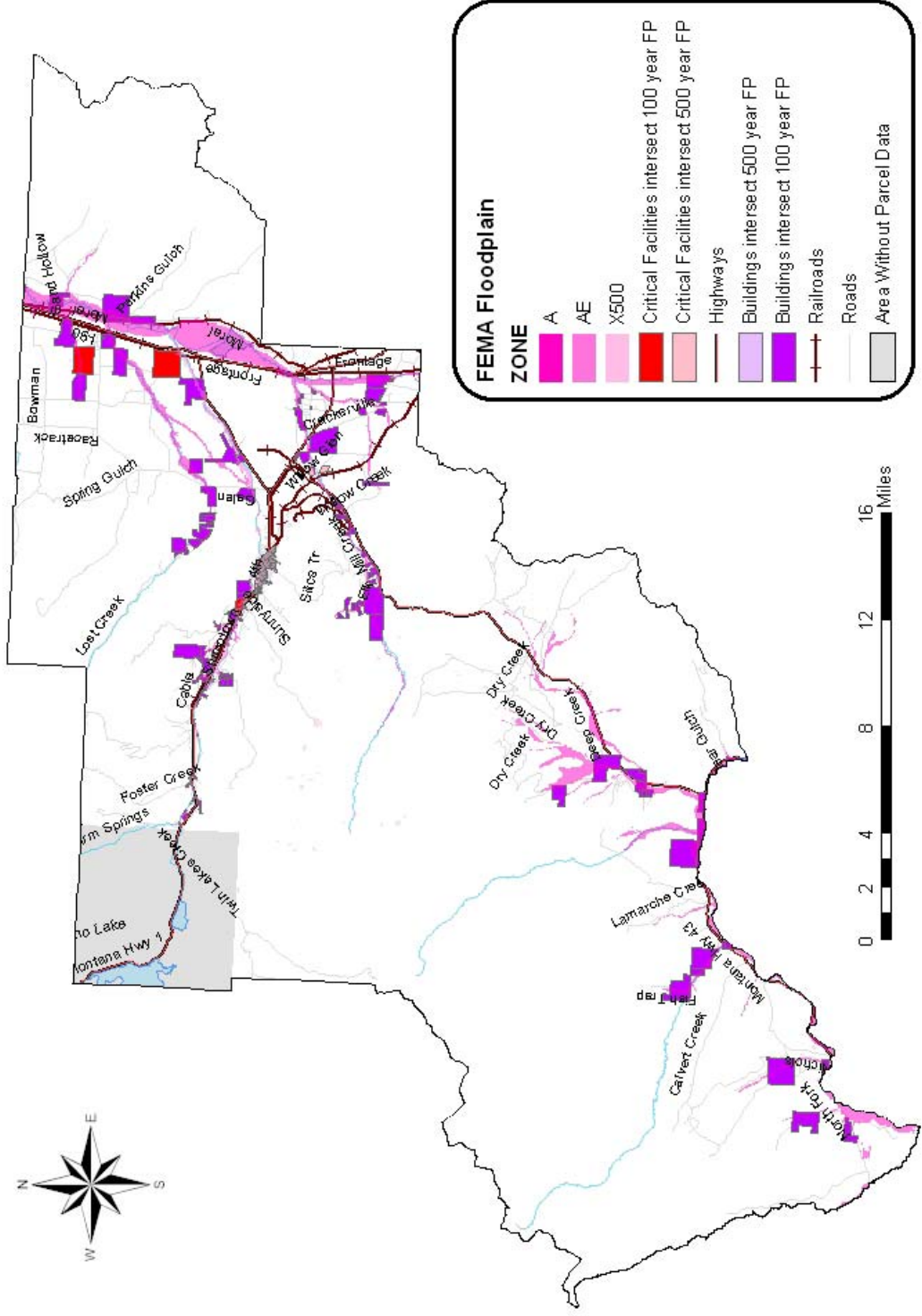


Mapping

In addition to the floodplain mapping shown in Maps 4.33 through 4.40, the mapping can be used to show the relationship of critical facilities and structures to the floodplain. Maps 4.43 through 4.48 show the parcels with critical facilities (shades of red) and parcels with taxable structures (shades of purple) in the 100- and 500-year floodplains.

Map 4.43

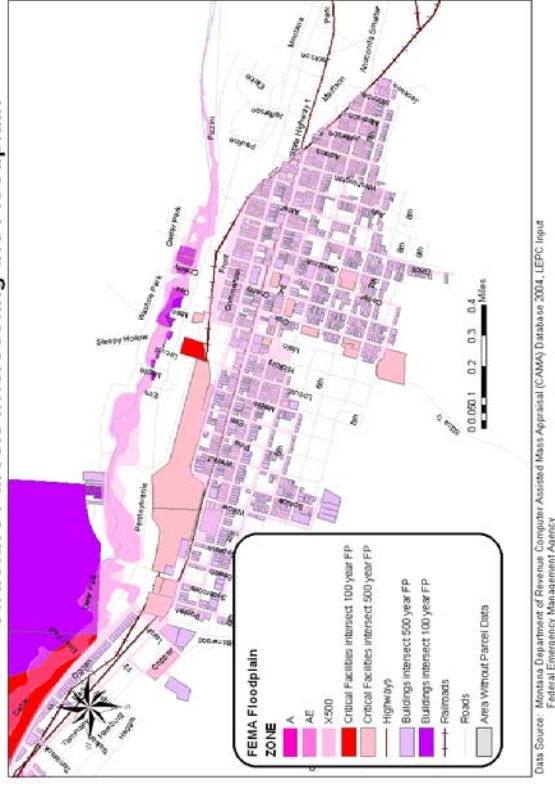
Deer Lodge County, Montana Structure Parcels Intersecting the Floodplain



Data Source: Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) Database 2004, LEPC Input
Federal Emergency Management Agency

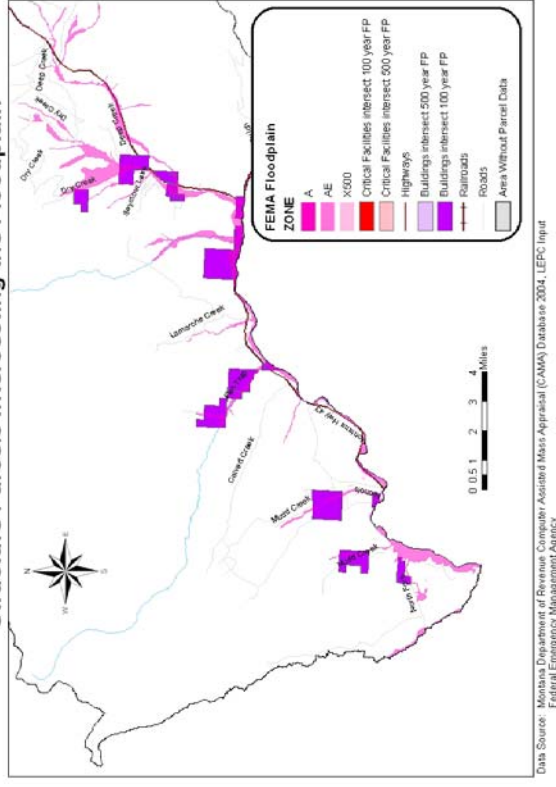
Map 4.44

Anaconda, Montana
Structure Parcels Intersecting the Floodplain



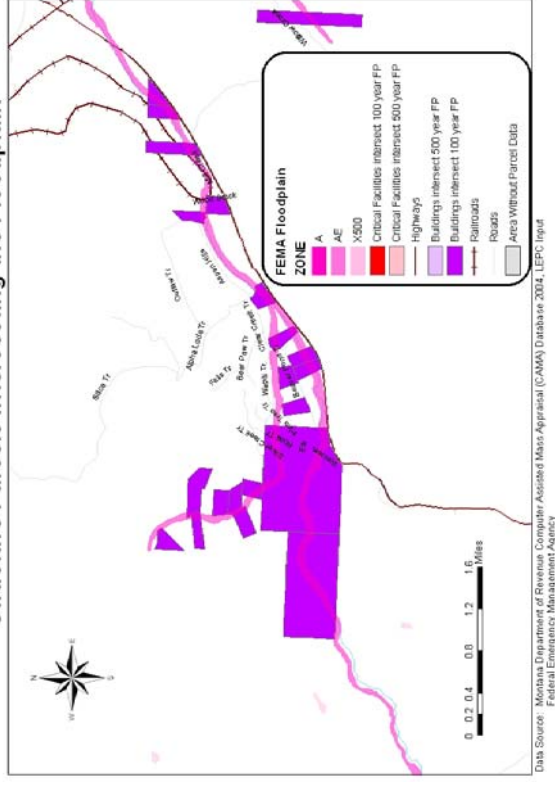
Map 4.46

Big Hole Valley, Montana
Structure Parcels Intersecting the Floodplain



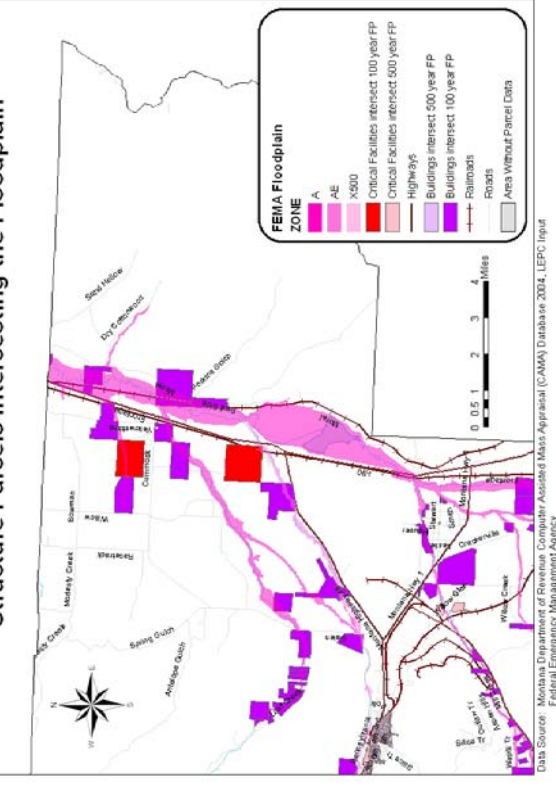
Map 4.45

Aspen Hills/Clear Creek, Montana
Structure Parcels Intersecting the Floodplain



Map 4.47

Northeast Deer Lodge County, Montana
Structure Parcels Intersecting the Floodplain



West Valley, Montana Structure Parcels Intersecting the Floodplain



Associated Hazards and Other Factors

Excessive rainfall and heavy snows associated with flooding, both riverine and flash, can be related to other hazards. Landslides and mudslides are often attributed to saturated soils and flooding. Flood conditions in and around dams can also be a factor in causing dam failures. During the summer, severe thunderstorms can bring heavy rain along with the wind, hail, and tornadoes, especially if they are slow moving. Often the runoff causes sediment problems in addition to the flooding. These additional hazards can be factors during flood events.

A factor making a difference in flood prevention is the community. Anaconda-Deer Lodge County has actively applied for mitigation funding to conduct activities that will lessen the flood hazard to its residence and infrastructure. Table 4.49 lists the projects applied for in February 1996 under the FEMA Hazard Mitigation Grant Program (HMGP).

Table 4.49 Proposed HMGP Project in February 1996 for Deer Lodge County

Project	Description	Additional Information
Philips Lane (3) West Valley	Two 24"x36" culverts and build up the roadway	Extensive flood history, loss of home, well, and septic system during flood events of 1979, 1981, 1986, 1990, 1991, 1992, 1993, 1994, 1995, and 1996 despite sand bagging
Lime Quarry Access Road West Valley	Cut new drain ditch into an old quarry pit	
Saddle Club Irrigation Ditch (1) (Behind Aruish Residence) West Valley	24" and 48" controlled headgates to direct 40% of water across Highway 1A	Regular irrigation ditch flooding for 25-30 years, well and septic loss and contamination, homes flooded
Powell Street West Valley	Build up Powell Street Alley and install 24" culvert	
Warren Street (2) West Valley	Install 36" culvert in Warren Street Alley	
Anderson Residence (1) West Valley	Two headgates and clean ditch	
North Jones Lane (1) West Valley	Two 36" headgates and six drop boxes east of Higgins Street	
Geary Gulch (4) West Valley	Build up road and install two new culverts	Loss of road and ditches
North Cable Road West Valley	Replace 18" culverts with 36" culverts to prevent runoff over the road	
Delasara Residence (1) West Valley	New bridge, two new headgates, and clean ditches	
Heaphy Lane	Install new 60" culvert and two 24" culverts	Extensive flood history, loss of well, septic system, and sewer treatment plant, road washouts, and damage to ditches and headgates during flood events of 1981, 1986, 1989, 1992, 1994, and 1996

In parentheses: Priority per June 17, 1996 letter to Montana Disaster and Emergency Services

Vulnerability

Critical Facilities

An analysis of the floodplain shows several critical facilities are in or close to the 100- and 500-year floodplains. The FEMA Flood Insurance Study notes that part of Anaconda, Warm Springs, the State Hospital, the Fish & Game fish hatchery, and the game farm at Warm Springs all lie in the floodplain. Larger floods affect the areas of Washoe Park, Deer Park, homes in the Cedar and Park Street areas, and a few homes immediately west of Meyers Dam. The study also notes that eight bridges north of Anaconda and four in Warm Springs restrict flow and cause flooding.³⁴

A GIS analysis using the Q3 floodplain data and the Montana Department of Revenue Computer Assisted Mass Appraisal (CAMA) database, identified the parcels that were partially in the floodplain. A significant limitation with this approach is that both datasets are inexact and the results should only be used for planning purposes and are not an actual flood zone determination. In addition, even though a parcel has land in the floodplain that does not mean the structure located there. Therefore, this approach identifies the critical facilities at greatest risk from flooding.

One critical facility, the Well Houses, has its center within the 100-year floodplain. Seven others have some section of their parcel within the 100-year floodplain. These critical facilities are:

- West Valley Fire Station
- Wastewater Treatment Plant
- Bowman Field Airport
- Bonneville Power Substation
- Warm Springs State Hospital
- Galen State Hospital
- Mount Haggin Baptist Church (shelter)

In addition to those facilities listed under the 100-year floodplain, the following 23 additional facilities coincide with the 500-year floodplain:

- Anaconda-Deer Lodge Courthouse, Law Enforcement, and Dispatch
- Coroner's Office/Historical Society
- Anaconda Fire Station
- BAP Rail Yards
- Car Barns
- Anaconda Post Office
- Hearthstone
- New Horizons
- Hagan Manor
- Community Nursing Home of Anaconda
- Metcalf Senior Citizen Center
- Fred Moodry Middle School
- Dwyer Primary School
- Dwyer Intermediate School
- Lincoln Elementary School
- Headstart
- Anaconda PCA Family Resource Center
- Anaconda Elks Club (shelter)

- LDS Church (shelter)
- Grace Baptist Church (shelter)
- Assembly of God (shelter)
- Hope Lutheran Church (shelter)
- United Methodist Church (shelter)

As this analysis shows, 8 critical facilities are exposed to the 100-year flood and many more would be vulnerable in a 500-year flood. The numbers increase dramatically for the 500-year flood because many of downtown Anaconda's roadways become streams from the runoff of various gulches and higher terrain to the south. Ultimately, many critical facilities can be expected to lose their functionality or sustain damages during a major flood.

The vulnerabilities to flash flooding are harder to quantify without specific hazard data. In Montana, however, flash flooding has been known to be most problematic to public infrastructure such as roads. As history has shown, flood events frequently wash out roadways in Deer Lodge County. Specific critical facilities have not been identified as more susceptible to flash flooding.

Potential Losses

Using the same methodology as was used for the critical facility analysis, land parcels were compared to the location of the 100- and 500-year floodplains. In this analysis, the tax appraisal of any buildings located on that parcel determined if a structure exists on that parcel, and if it one does, what its value may be. In total, 252 buildings were on parcels that coincided with the 100-year floodplain. Based on the tax assessed values, those buildings are worth \$12,897,233 in total exposure. These figures lead to the following loss estimates for planning purposes:

- 252 structures are estimated in or near the 100-year flood inundation area with a total estimated structure value exposure of \$12,897,233.
- In most cases, many of the structures would only have moderate, minor, or no damage, and some may not even lie within the floodplain due to the methodology used, so an estimate of 20% is used as the damage factor.
- \$12,897,233 total estimated structure value x 20% damage factor = \$2,579,447 estimated 100-year structure losses.

When using the same methodology for the 500-year floodplain, the following loss estimates for planning purposes can be made:

- 1,721 structures are estimated in or near the 500-year flood inundation area with a total estimated structure value exposure of \$73,930,893.
- In most cases, many of the structures would only have moderate, minor, or no damage, and some may not even lie within the floodplain due to the methodology used, so an estimate of 20% is used as the damage factor.
- \$73,930,893 total estimated structure value x 20% damage factor = \$14,786,177 estimated 500-year structure losses.

As of September 30, 2004, Deer Lodge County had only 10 flood insurance policies for a total of \$872,900 insurance coverage leaving much of a flood vulnerable community without any financial coverage for flood damages. According to the State Floodplain Manager, Deer Lodge County does not have any repetitive loss flood insurance properties.

Comparing US Census TIGER road data with the Q3 floodplain data, approximately 98 miles of roads coincide with the 100-year floodplain and an additional 28 miles coincide with the 500-year floodplain. Since roadbeds may be elevated above 100- and 500-year flood levels, this assessment doesn't specify if the roadway is in the floodplain, but does give an estimate of the exposure.

Potential Population Impacts

Due to the terrain and hazard areas in and around Anaconda, the population is considered to be at moderate risk for riverine and flash flooding. Some warning does exist, particularly with riverine flooding, but rapidly occurring events may leave the population unprepared and in a dangerous situation. The impacts from flash flooding could be even greater in areas downstream from wildfire burn areas. Flash flooding often occurs without warning. The population estimated in the 100-year floodplain is 479 people (252 structures x 1.9 people/structure) and 3,269 people (1,721 structures x 1.9 people structure) in the 500-year floodplain. The population in flash flood areas is unknown as flash flood can occur almost anywhere.

Impact of Future Development

Anaconda-Deer Lodge County is mapped and participates in the National Flood Insurance Program as established in Anaconda-Deer Lodge County Ordinance 106. As a participant in this program, specific development considerations must be made and a permit issued before development can occur in the 100-year floodplain. Culverts and bridges on natural watercourses must be designed by a professional engineer and pass the 100-year flood without damage to the bridge or culvert and without diverting floodwaters. Those culverts and bridges not on a natural watercourse must pass runoff from a 10-year, 6 hour storm event. The Georgetown Lake Development District requires runoff and erosion control measures for large developments and includes enhanced wetland, stream, and lakeshore protections. The Big Hole Ordinance adopted by communities along the Big Hole River in 2005 prohibits development within 500 feet of the high water mark.³⁵

Other than those specific requirements, development can occur in and around the floodplain. Since 2000, Deer Lodge County's population has decreased by about 300 people, so growth is slow when compared to the rest of the state. Development does continue, however, and many of the more desirable locations are near the rivers and creeks.

Data Limitations

The greatest limitations for analyzing the flood risk in Deer Lodge County are two key factors: a lack of digital structure data showing where structures are situated with respect to the floodplain and old, outdated floodplain mapping with many unmapped flood prone areas. These data limitations prohibit a detailed study of the potential losses from any given flood. Historical records also often lack definitive figures on the damages and areas most affected.

The HAZUS-MH program is limited in its accuracy for flood losses due to the limitations in the default data, but more importantly because of its incompatibility with most common versions of

³⁵ Anaconda Leader, April 22, 2005.

software and operating systems. Should these limitations be overcome, a more accurate estimate of flood losses could be determined using HAZUS-MH.

HAZARDOUS MATERIALS

Description

A hazardous material release is the contamination of the environment (i.e. air, water, soil) by any material that because of its quantity, concentration, or physical or chemical characteristics threatens human health, the environment, or property. An accidental or intentional release of materials could produce a health hazard to those in the immediate area, downwind, and/or downstream. A hazardous material release can come from a fixed facility or via its transportation through the area.

The Anaconda-Deer Lodge County Hazardous Material Plan, dated November 2003, lists the fixed facilities housing hazardous materials in the County. Table 4.50 lists these facilities plus some additional energy facilities.

Table 4.50 Hazardous Materials Facilities³⁶

Name	Address	Notes
Northwestern Energy Offices	1000 East Commercial	Possible PCB transformer oil storage
Bonneville Power Substation	Mill Creek & Willow Glen Roads	Possible PCB transformer oil storage
Northwestern Energy Substation	North Cedar	Possible PCB transformer oil storage
Northwestern Energy Substation	Mill Creek Road	
Natural Gas Line (24")	Morrell Road	
Magnum – Petroleum – Beck Fuel	323 East Pennsylvania Street	Gas-Oil-Diesel, 1000 ft evacuation
Albertson's/Osco Drug	1300 East Park Avenue	Hardware Store & Paint Products
Safeway	Park & Larch	Hardware Store
Hardware Hank	216 West Park	Hardware Store & Paint Products
D&L Auto Sales	200 East Commercial	Paint Products
Dye's Auto Parts	107 Main	Paint Products
Peterson Paints	124 East Commercial	Paint Products
Dee's Motors	1200 East Commercial	Paint Products
Cook's Collision	416 East Park	Paint Products
Thriftway Super Stop	1420 East Commercial	Propane Storage & Gasoline
Town Pump East	Montana One West	Propane Storage & Gasoline
Town Pump West	819 West Park	Propane Storage & Gasoline
Washoe Park Swimming Pool		Chlorine Gas Storage
Memorial Gym	Fifth & Hickory	Chlorine Gas Storage
Fairmont Hot Springs	East of Anaconda	Chlorine Gas Storage
Montana State Hospital	Warm Springs	Chlorine Gas Storage/Propane/Gas
Anaconda Foundry	Sixth & Jefferson	Acetylene Storage
Anaconda-Deer Lodge County Shop	800 South Main	Acetylene Storage
Anaconda Job Corps Center	1407 Foster Creek Road	Paint Products, Diesel
Anaconda-Deer Lodge Water Department	50 North Main Street	Chlorine
Anaconda-Deer Lodge Weed Department	Southeast corner of Pennsylvania and Cedar	Herbicide chemicals

The most likely locations for a transportation-related hazardous materials release is on Interstate 90, Highway 1, or the active railways. Interstate 90 crosses eastern Deer Lodge County in a north-south direction. This Interstate is widely used by vehicles transporting hazardous materials. Highway 1 is the highway passing through Anaconda and the scenic Pintler Region. This highway is often used as a scenic bypass of Interstate 90 and is used for access to Philipsburg, Georgetown Lake, and Anaconda. The railroad that runs through Anaconda is owned and operated by Rarus Railway Company. The

³⁶ Anaconda-Deer Lodge County Hazardous Material Plan, November 2003.

short line railroad runs through Anaconda to Butte where it meets up with Burlington Northern and Santa Fe Railways. Rarus Railways primarily hauls scrap, copper slag, and copper concentrates. Burlington Northern and Santa Fe Railways (BNSF) operates the railway that runs along Interstate 90 from Garrison to Butte. This railroad hauls all types of materials, frequently including hazardous materials.

The Anaconda-Deer Lodge County Hazardous Material Plan identifies the primary “County Transportation Hazardous Areas” as:

- I-90 Warm Springs Interchange and major railroad crossings in the area
- Highway 48 and old Highway 10 Junction with railroad crossing
- Opportunity overpass with railroad crossing
- North Main Street with railroad crossing
- Mill Creek Highway with railroad crossing
- Fairmont Hot Springs with railroad crossing
- Galen Campus with railroad crossing
- Gas City with railroad crossing
- Perkins Lane and I-90 Racetrack Interchange with railroad crossing
- Fourteen miles of interstate highway with density usage for hauling hazardous materials and waste
- Railroad servicing Rarus Railroad

History

Historically, incidents have been small enough to prevent a large evacuation, however, hazardous materials incidents do occur in Deer Lodge County. The incidents logged with the National Response Center and those identified by area residents follow.

April 20, 1992. A utility worker was overcome by natural gas when repairing the line during union protests near Warm Springs.³⁷

June 1997. A carbon monoxide leak in the Washoe Theater sent 56 people to the hospital. Approximately 450 people were evacuated from the theater and 157 people in all were treated.

August 27, 2004. Thirty male students were treated for carbon monoxide poisoning when a heating system exhaust pipe leaked into a dormitory at the Anaconda Job Corps Center.³⁸

Probability

The probability of a hazardous materials release can only be realistically assessed qualitatively. The history of events in Deer Lodge County is low with only three events over the past 15 years, none of which have resulted in a disaster declaration. The exposure however is moderate to high with Interstate 90 passing within close proximity to critical facilities and an active railroad within Anaconda

³⁷ National Response Center. <http://www.nrc.uscg.mil/foia.html>

³⁸ The Missoulian. <http://www.missoulian.com/articles/2004/09/08/mtracker/news/57monoxide.txt>.

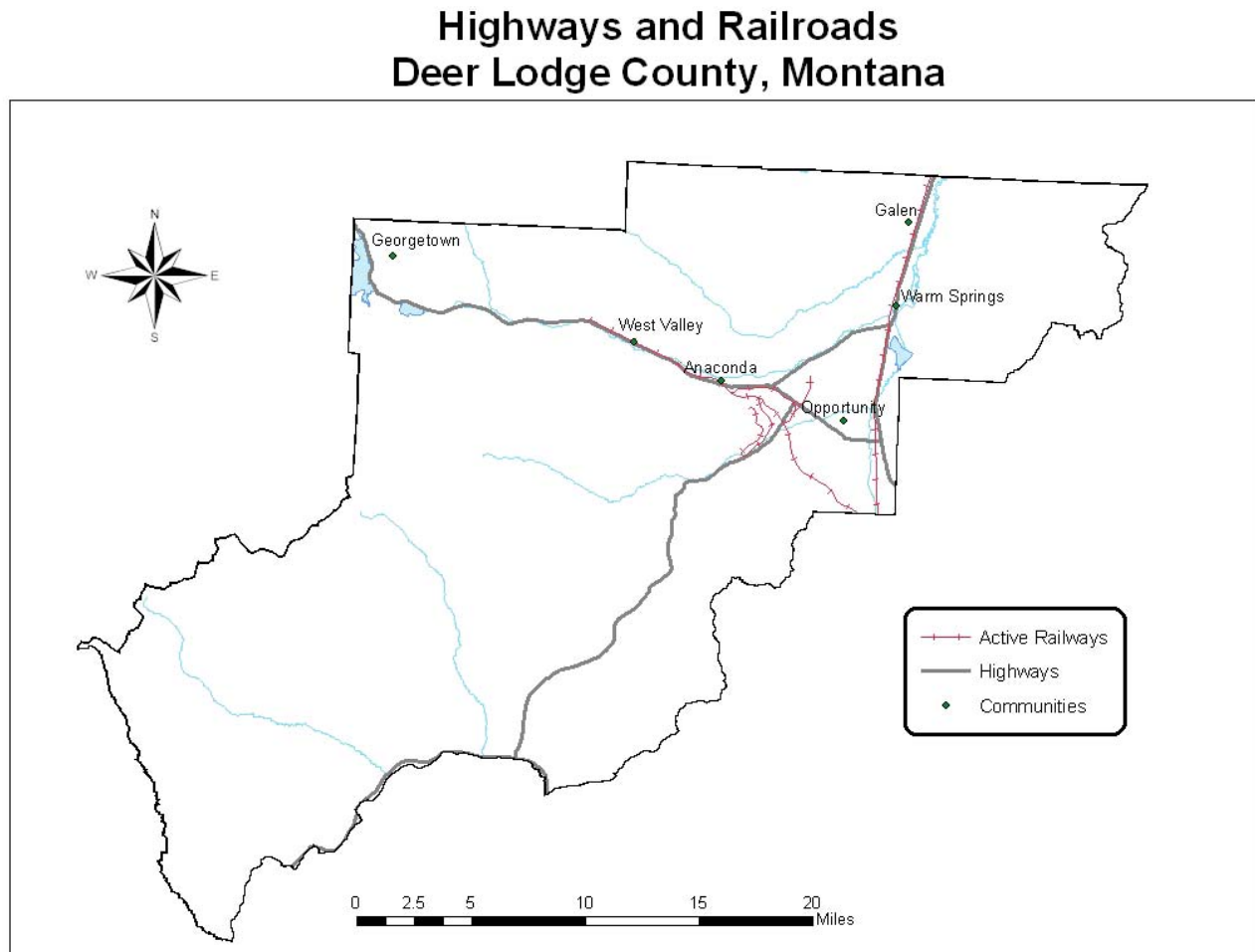
and Warm Springs. Therefore, the probability of a hazardous materials release that would require a significant government and public response is considered moderate.

In neighboring Silver Bow County, a survey from November 1996 of the hazardous materials placards on Interstate 90 showed 56.4 commercial vehicles per hour used the Interstate with 6.8 of those vehicles carrying hazardous materials. Similar figures could be assumed for neighboring Deer Lodge County.

Mapping

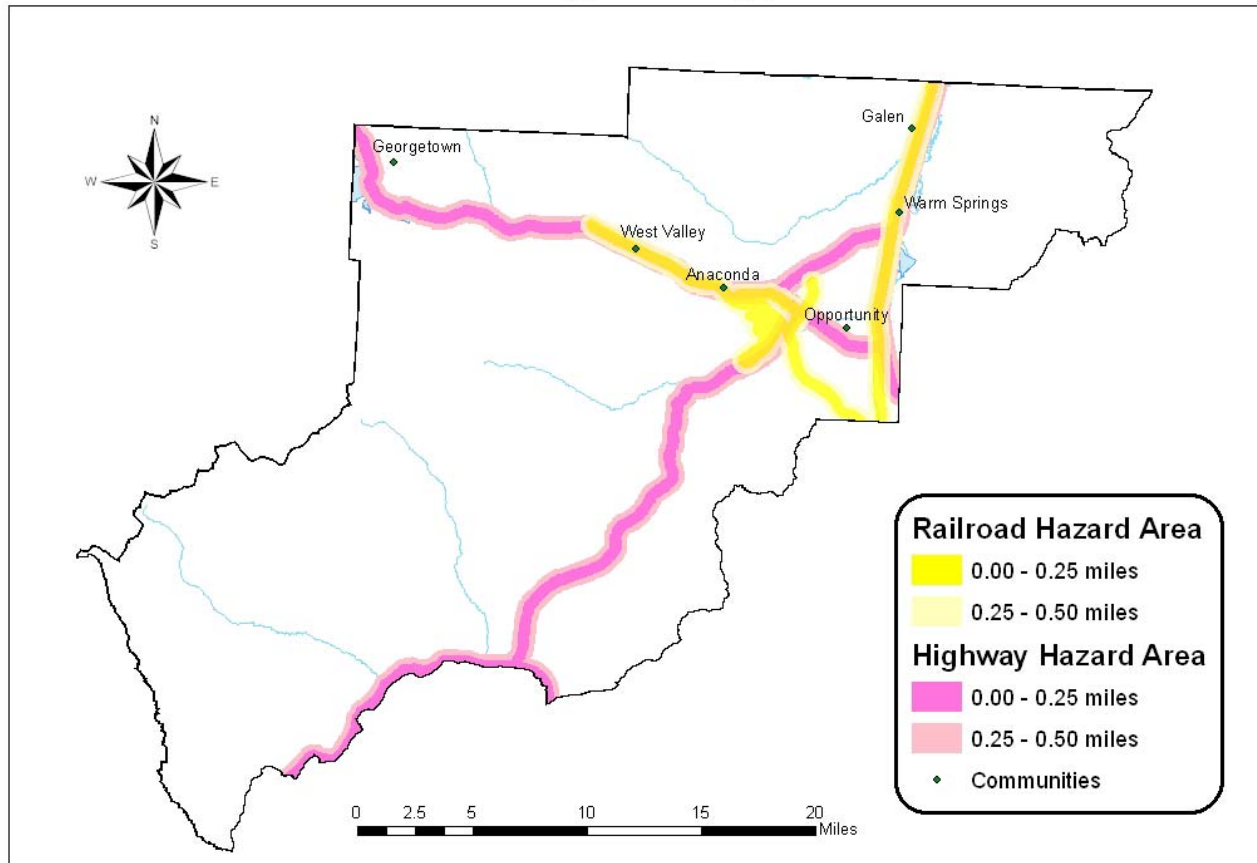
Map 4.51 shows the major roadways transporting hazardous materials and the active railroads in Deer Lodge County.

Map 4.51



As with many hazards, the degree of risk to a particular area is hard to quantify, however, buffer zones were created around the major hazardous materials transportation routes to show the areas that would most likely be affected in a hazardous materials incident. Of course, the entire county is at some risk for a hazardous material release, but the areas shown in Map 4.52 are at the greatest risk given their proximity to areas where hazardous materials can typically be found.

Hazardous Materials Transportation Buffer Zones Deer Lodge County, Montana



Associated Hazards and Other Factors

Hazardous material releases can be accidental or intentional. Accidental causes can be due to a ground, air, or railroad accident. Almost any other hazard event may also lead to a hazardous material release. Destruction of a facility or transportation infrastructure may lead to a hazardous material release. Examples include earthquake, flooding, wildfire, avalanche, landslide, dam failure, severe thunderstorm, tornado, wind, structure fire, or even a volcano. Intentional releases may be related to terrorism or a domestic disturbance. A hazardous material release, if severe enough, could lead to civil unrest, a fiery explosion, or utility failure. With the potential for a hazardous material release to be caused by another event, the release could certainly aggravate the situation.

Vulnerability

Critical Facilities

The buffers around the highways and railways represent the areas that are an enhanced risk for a hazardous materials release. Two buffer zones were established, 0.25 miles and 0.50 miles from the

route. These buffer zones were chosen based on minimum evacuation radii that would be established for a typical hazardous substance release. Of course, the actual evacuation zone for an event is highly dependent on many factors including wind speed, wind direction, material released, and quantity released. Like many of the other hazards, the hazard area in an actual event will not involve the entire area at risk, but more likely a small section of the identified area, and therefore, a small percentage of the critical facilities. Based on these buffer zones, the following figures demonstrate the critical facilities at risk.

- 44 of 56 critical facilities are within 0.25 miles of major highways
- 35 of 56 critical facilities are within 0.25 miles of active railroad
- 51 of 56 critical facilities are within 0.50 miles of major highways
- 48 of 56 critical facilities are within 0.50 miles of active railroad

Since the Interstate 90 and BNSF corridor hauls more hazardous materials than the other transportation routes, the highest risk can be assumed to be in that area. The only critical facility within .25 miles of the BNSF railroad and Interstate 90 is Montana State Hospital.

Potential Losses

Using the same methodology as was used for the critical facilities, the land parcels with structures on them were evaluated with respect to the highway and railroad buffer zones. The following estimates demonstrate the exposure of structures to transportation related hazardous materials incidents.

- 66% or 2,643 of 4,006 mapped structure parcels are within 0.25 miles of major highways
- 54% or 2,152 of 4,006 mapped structure parcels are within 0.25 miles of active railroad
- 89% or 3,577 of 4,006 mapped structure parcels are within 0.50 miles of major highways
- 79% or 3,180 of 4,006 mapped structure parcels are within 0.50 miles of active railroad

More specifically in the highest hazard area, six structures are within 0.25 miles of Interstate 90 and the BNSF railway. Seven additional structures are within 0.25 miles of the BNSF railway.

Fortunately, unless an explosion is present with the release, structures are typically not damaged in a hazardous materials release.

Potential Population Impacts

The population impacts from a hazardous materials release are more significant than the potential structure losses. Depending on the material, the health impacts to the public can be long and short term. Should a release occur in Anaconda, the population impacts would be much greater than if one occurred in a more rural area. The other particularly vulnerable population is the Montana State Hospital at Warm Springs. The hospital is in close proximity to both the railroad and Interstate 90 with the only exit passing within close proximity of the hazard area.

Estimating the population to be roughly 1.9 people per structure (9,417 total population / 4,958 total structures), the population exposure can be estimated as follows:

- 5,022 people live within 0.25 miles of major highways

- 4,089 people live within 0.25 miles of active railroad
- 6,796 people live within 0.50 miles of major highways
- 6,042 people live within 0.50 miles of active railroad
- Approximately 12 people live within 0.25 miles of Interstate 90 and the BNSF railway
- Approximately 25 people live within 0.25 miles of BNSF railway
- Approximately 600 patients and staff are present at Montana State Hospital at any given time

In a hazardous materials release, those in the immediate area would have little to no warning, whereas, the population in the dispersion path may have some time to evacuate, depending on the weather conditions and material released.

Impact of Future Development

Future development should have very little impact on this hazard for now. Currently the growth in Deer Lodge County is slow and is primarily taking place away from the railroads and highways. Should development occur in the area of the Interstate and railroad, however, the population exposure to hazardous materials would significantly increase. Much of this land is currently part of the EPA's Superfund site.

Data Limitations

Understanding when, where, and what substances are mostly likely to be released in an incident is the greatest limitation in analyzing this hazard. So many substances pass through Deer Lodge County without incident that fully describing how a release may occur and what population and structures may be affected is not possible. A study of the number and types of hazardous materials passing through Deer Lodge County would help better frame this profile.

LANDSLIDE and GROUND/SOIL FAILURE

Description

Landslides occur when material on the surface of the earth cannot be supported any longer and gives way to gravity. Some landslides move slowly and cause damage gradually, whereas others move so rapidly that they can destroy property and take lives suddenly and unexpectedly. Gravity is the force driving landslide movement. Factors that allow the force of gravity to overcome the resistance of earth material to landslide movement include: saturation by water, steepening of slopes by erosion or construction, alternate freezing or thawing, earthquake shaking, and volcanic eruptions. Landslides are typically associated with periods of heavy rainfall or rapid snow melt and tend to worsen the effects of flooding that often accompanies these events. In areas burned by forest and brush fires, a lower threshold of precipitation may initiate landslides.³⁹

Ground or soil failure may occur in areas of unstable soils or sinkholes. Mining in the region may have also left behind unknown shallow mines that, given the right conditions, can cave in. This hazard has very little predictability and history in Deer Lodge County.

History

The only area known to have mudslides, as identified by Anaconda residents, is above Maple Street on the South side of Anaconda. Mud frequently flows down from this area during periods of heavy rain. Minor landslides did occur on Mt. Haggin during the Borah Peak earthquake.

Probability

Landslides and ground failure have a low probability of creating a disaster based on a very limited history of events. Should landslides occur, they typically do not affect life or property due to their locations in remote areas. The probability of a damaging landslide could greatly increase if development were to occur in landslide prone areas. Wildfire burn areas also greatly increase the probability of a landslide triggered by precipitation.

Mapping

Landslides, due to their site specific nature, are a difficult hazard to map. A national map has been produced by the US Geological Survey as part of a study. This study looked at incidence and susceptibility of landslides on a nationwide basis. Therefore, the areas identified are general and are not exact on the county scale. The following is noted in the USGS study, "Susceptibility is not indicated where same or lower than incidence. Susceptibility to landsliding was defined as the probable degree of response of [the areal] rocks and soils to natural or artificial cutting or loading of slopes, or to anomalously high precipitation. High, moderate, and low susceptibility are delimited by the same percentages used in classifying the incidence of landsliding. Some generalization was necessary at this scale, and several small areas of high incidence and susceptibility were slightly exaggerated."⁴⁰ Only one small area in extreme northeast Deer Lodge County is considered to have a

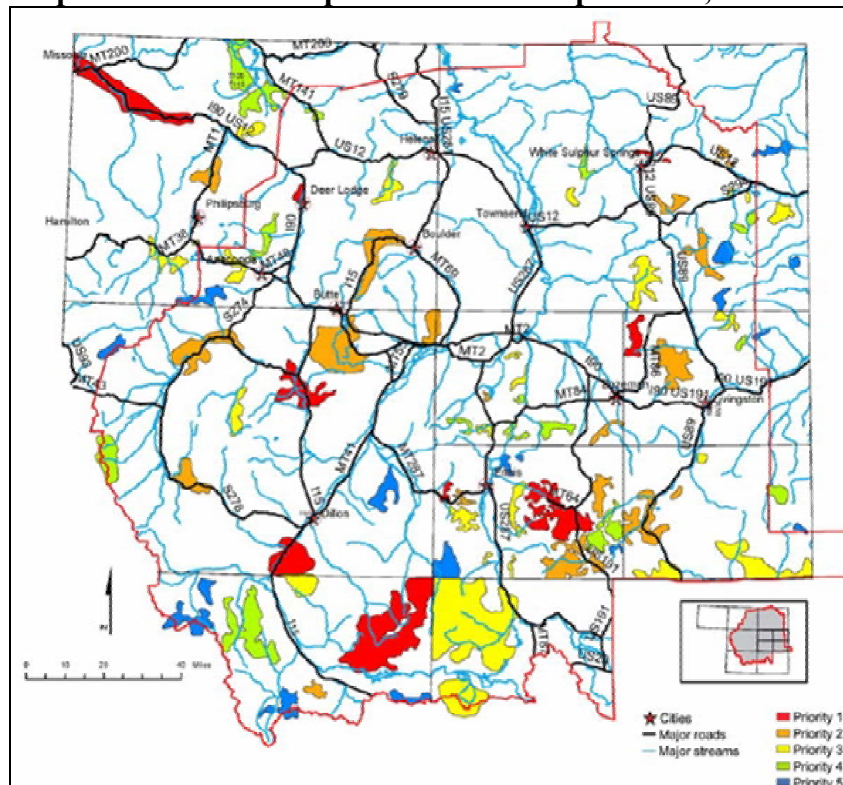
³⁹ Federal Emergency Management Agency, www.fema.gov.

⁴⁰ Godt, Jonathan W. USGS Open-File Report 97-289. 1997.

moderate susceptibility with low landslide incidence. The remainder of the county has a low incidence and low susceptibility based on this national study.

The Montana Department of Transportation, District 2 has mapped the priority areas for landslide mitigation. The determination of priorities was based on an inventory of landslides and their proximity to state highways. Deer Lodge County, in the northwest section of the District 2 in Map 4.53, has Priority 2, 3, 4, and 5 areas.

Map 4.53 Montana Department of Transportation, District 2 Landslide Priority Areas¹⁸



Associated Hazards and Other Factors

Landslides can be linked to several different hazards. Following a wildfire, the burnt area can often be very prone to landslides, particularly when combined with heavy rainfall. In fact, given enough rainfall, landslides and the associated mudflows can occur almost anywhere with a slope and are typically partnered with flash flooding off mountainous areas. The massive Hebgen Lake landslide in nearby Madison County was triggered by a strong earthquake. This potential also exists in Deer Lodge County.

Vulnerability

Critical Facilities

Critical facilities in Deer Lodge County historically have not suffered losses or been threatened by landslides. Therefore, the probability is very low for critical facilities to be affected. Most facilities are located outside of steep slope areas except for places like the County Courthouse and Law

Enforcement Center that are in steep locations on the south end of Anaconda. Roadways and communications equipment are additional exceptions. Some sections of state highways and county roads are known to have possible landslide hazards, as shown in Map 4.53. Typically, communications equipment, such as radio towers, are located on mountain peaks and are somewhat protected due to their locations near the peaks but are not immune to landslides. Potential losses to roadways and communications equipment could easily total into the hundreds of thousands of dollars, but the probability of such an event is considered very low.

Potential Losses

Like critical facilities, potential losses to other structures are considered low. Most landslide prone areas are located on federal or state lands and do not have significant numbers of structures. The structures that are most susceptible to landslides are those on steep slopes or at the bottom of a draw.

Potential Population Impacts

The National Weather Service issues flash flood warnings during periods of rainfall or snow melt that have a high likelihood of causing flash flooding. Such flooding and rapid runoff may trigger land and mud slides. Without any documentation supporting any deaths or injuries from landslides in Deer Lodge County, the potential for large population impacts is considered low.

Impact of Future Development

Fortunately, most landslide prone areas in Deer Lodge County are within publicly owned lands. Should development on private land coincide with landslide areas, however, the impact of future development could have negative consequences on life and property. Therefore, development should be restricted or require geotechnical studies on slopes greater than 20%. The Anaconda-Deer Lodge County Subdivision Regulations do restrict subdivisions on slopes steeper than 25%.

Data Limitations

The data on landslide hazards in Deer Lodge County is quite limited. These hazards are not expected to seriously threaten the community, and therefore, have not been studied thoroughly. The data that does exist is either on a national, not county-wide, scale or is old and somewhat obsolete. Landslides are such site specific events that pinpointing vulnerable areas is quite difficult and costly. Therefore, this hazard profile is general in nature and could be more specific if better data is ever compiled. Irregardless, individual property owners are encouraged to consider the landslide and ground failure hazards specific to their site.

STRUCTURE FIRES

Description

Although structure fires are usually individual disasters and not community-wide ones, the potential exists for widespread structure fires that displace several businesses or families. Urban blocks, commercial structures, apartment buildings, and tightly spaced houses are especially vulnerable. Anaconda is the only community in Deer Lodge County with a dense, historic downtown area vulnerable to this hazard. A structure fire that rages uncontrollably despite firefighting efforts and burns a large portion of a downtown area or several homes could have significant economic or community impacts. Large fires of this nature have also been known to require significant community resources, if lives are lost.

The mining industry of the area employed much of the population at one time. During those times, many workers would bring home dynamite and sometimes store it in their basements. Now, many years later, dynamite can still be found in basements around Anaconda, sometimes without the residents knowing it. The possibility of explosions during structure fires is an increased hazard for firefighters and the general population.

History

Anaconda has an extensive history of major structure fires dating back to 1887. The events listed in Table 4.54 were identified through research in the Anaconda Leader Newspaper Archives and by the Anaconda Fire Department. A pictorial history can be found at the Copper Village Museum.

Table 4.54 Historic Major Structure/Mine Fires in Deer Lodge County, Montana

Date	Location
1/12/1887	Palace Hotel, Front and Cedar
12/17/1887	Half block on Main Street from Cohen's Store to the Depot
9/11/1889	Main and First Street
11/24/1889	Anaconda Mine
12/4/1889	Mitchell and Snyder Hospital, Third and Main
9/24/1901	Anaconda Standard Composing Room
2/4/1902	Olson Gulch Concentrator
3/3/1903	Arthur Fortier's Barber Shop
11/3/1906	114 East Commercial Apartment Building
8/20/1907	Washoe Coal Bunkers
1929	Margaret/Sundial Theater
3/22/1931	O.K. Store
5/27/1931	Marbleton Block
8/24/1931	Baltimore Rooming House
1/24/1933	Turner Hall
Mid 1940's	Montgomery Ward Fire, days later a man was killed when a wall fell
1946	Turgeson Motors
1953	Ford Motor Company Explosion, windows blown 4 blocks
10/30/1953	Flood Block Explosion and Fire, 9 killed
1959	MacIntyres Clothing Store and Copper Bowl

Table 4.54 (continued) Historic Major Structure/Mine Fires in Deer Lodge County, Montana

Date	Location
Late 1960's	Pals Bar
1972	Reno Supper Club
1975	Woolworth's Building
Dec. 1976	A1 Lumber
Late 1970's	Washoe Market
1978	Fashion Flair
1985	Durston Block – 101 South Main
12/24/1985	Knights of Columbus Building
Late 1980's	Mayflower Garage
Late 1980's	Lucky Lady
Late 1990's	McDonald Fire, East Sixth Street, 1 child died
1998	Montana Power Substation Fire, \$1M loss
7/13/1999	Alder Street Fire, 4 structures burned (3 homes, 1 garage)
1/10/2001	Carmel's Bar, East Third
10/31/2001	305 East Front, 2 killed
8/22/2002	Cook's Collision – East Park

Probability

Over the past 25 years, ten major structure fires have occurred. Recent history would therefore indicate the probability of a major structure fire is once every 2.5 years or a 40% chance in any given year. None of the historical fires have resulted in a Presidential Disaster Declaration, so the probability of a fire of that magnitude is considered low.

Mapping

Mapping does not presently exist outlining the areas of highest risk, except to say that the downtown area of Anaconda is the most vulnerable.

Associated Hazards and Other Factors

Structure fires can be linked to other potential hazards. Depending on the location of the fire, hazardous materials could be released. The event may also be linked to terrorism if intentionally set to instill fear in the population or disrupt the economy. Although lightning does not fit into the definition of severe thunderstorms, lightning from any thunderstorm could spark a significant structure fire. Possibly the greatest factors that determine if the structure fire will be severe are the age and condition of the structure, if it's been sprinklered, and the preparedness level of the fire department.

Vulnerability

Critical Facilities

All of the critical facilities are considered to be at risk from a structure fire. The government owned facilities are insured for fire, but many of the paper records could be unrecoverable.

Potential Losses

Fire losses are usually covered by insurance, but can result in negative economic impacts for the area. Otherwise, structure losses are minimal, unless in an unlikely event a significant number of uninsured structures are destroyed.

Potential Population Impacts

The population is at risk from structure fire, particularly if the fire occurs in the location of a public gathering. Fires in theaters, restaurants, hotels, and enclosed event locations all have the possibility of resulting in mass casualties if the fire spreads rapidly or the facility is overcrowded. The probability of such an event with current alarm and sprinkler technologies, however, is considered low, and therefore, the potential population impact is also considered low.

Impact of Future Development

Most development is not occurring in the downtown urban areas. Therefore, future development should have little impact on this hazard unless additional dense, downtown areas are created. Current fire codes require new commercial structures be fitted with sprinkler systems.

Data Limitations

Structure fires in other parts of the country have resulted in Presidential Disaster Declarations, but assessing the probability of such an event in Deer Lodge County is challenging. The potential exists for major structure fires, but the significance of such an event will depend on the location, casualties, and resources needed. For these reasons, this hazard has been qualitatively profiled and could only be further assessed if more definitive data outlining the potential for major structure fires is developed.

TERRORISM and CIVIL DISORDERS

Description

Terrorism and civil disorders are human caused hazards that are intentional and often planned. Terrorism, both domestic and international, is a violent act done to try and influence government or the population of some political or social objective. Terrorist acts can come in many recognized forms or may be more subtle using untraditional methods. The primary recognized forms of terrorism are chemical, explosive, biological, radiological, and cyber.

Chemical terrorism is the use of chemical agents to poison, kill, or incapacitate the population. Chemical agents can be broke into five different categories: nerve agents, vesicants, cyanide, pulmonary agents, and incapacitating agents. Known nerve agents include tabun, sarin, soman, GF, and VX and can cause a variety of conditions affecting the central nervous system either in vapor or liquid form. Vesicants cause blisters on the skin and can damage eyes, airways, and other tissues and organs. Vesicant agents include sulfur mustard, Lewisite, and phosgene oxime. Cyanides can be in solid salt or volatile liquid format, or when combined with acid, a vapor or gas. Their absorption can cause everything from nausea to death, depending on the amount absorbed. Pulmonary agents such as phosgene and perfluroisobutylene cause pulmonary edema usually hours after exposure. Incapacitating agents produce reversible disturbances with the central nervous system and cognitive abilities and include the agent BZ.⁴¹

Terrorism using explosive and incendiary devices includes bombs and any other technique that creates an explosive, destructive effect. Bombs can take many forms from a car bomb to a mail bomb to any suspicious package. They are often designed to blend in with the environment and not appear to be unusual. Bombs can be physically triggered like in the case of a suicide bomb or remotely detonated.

Bioterrorism is the use of biological agents to infect the population or animals with disease. The agents/diseases that the Centers for Disease Control and Prevention consider the highest priority due to their threat to the population and national security include anthrax, botulism, plague, smallpox, tularemia, and viral hemorrhagic fevers.⁴² Bioterrorism could also be used against our livestock population and agricultural plants. The following are select animal diseases identified by the USDA as a severe threat to livestock and human health: Avian Influenza, Exotic Newcastle Disease, Nipah, Hendra, Eastern Equine Encephalitis, Venezuelan Equine Encephalomyelitis, Foot and Mouth Disease, Rift Valley Fever, Rinderpest, African Swine Fever, and Classical Swine Fever. Those plant diseases identified by the USDA as a severe threat to plants are: Soybean Rust, Southern Bacteria Wilt, Plum Pox, Downy Mildew of Corn, Brown Stripe Downey Mildew of Maize, Potato Wart, Bacterial Leaf Streak of Rice, Citrus Greening, and Pierce's Disease.⁴³

Radiological terrorism involves the use of radiological dispersal devices or nuclear facilities to attack the population. Exposure to radiation can cause radiation sickness, long-term illness, and even death. Terrorism experts fear the use of explosive and radiological devices in the form of a "dirty bomb" to

⁴¹ Sidell, Frederick R., M.D. Chemical Agent Terrorism.
<http://www.nbc-med.org/SiteContent/MedRef/OnlineRef/Other/chagter.html>.

⁴² Centers for Disease Control and Prevention, <http://www.cdc.gov/>.

⁴³ US Government Accountability Office. Homeland Security: Much Is Being Done to Protect Agriculture from a Terrorist Attack, but Important Challenges Remain. March 2005.

attack the population. As with chemical and biological events, radiological incidents present contamination challenges for first responders.

Cyberterrorism is the attack or hijack of the information technology infrastructure that is critical to the US security or economy through financial networks, government systems, mass media, or other systems. Any cyber attack that creates national unrest or instability would be considered cyberterrorism.

Civil unrest and violence are more at the local level where large groups, organizations, or distraught individuals take action with potentially disastrous or disruptive results. Civil unrest can be triggered by another event that creates panic in the community. Violence, particularly domestic violence, occurs on a regular basis, however, disasters are considered to be events that require a large number of response agencies to control the situation.

Montana has traditionally attracted activist/extremist individuals and groups because of its low population and large geographic area. Groups active in Montana vary from white supremacists to single issue groups, such as environmental extremists. These groups are attracted to the state and many of them view Montana as their "home" or safe haven. Because of these views, they commit their illegal activities outside of the state. An example of this would be the Unabomber, Ted Kaczynski. Kaczynski advocated the destruction of technology and the protection of the environment. The Unabomber was responsible for sixteen bombings and three deaths around the United States.

Another example, *The World Church of the Creator*, which is a white supremacist group with a national following, advocates a "Racial Holy War" against minorities. This group has their national meeting in Superior, Montana once a year. Members of this group have been responsible for numerous homicides in the United States.

Groups such as the Phineas Priesthood of Spokane, WA used western Montana as a place to hide. The anti-government group, the Freeman, conducted an eighty-one day standoff with law enforcement in eastern Montana. At the conclusion it was determined they were a "refuge" for individuals around the country involved in criminal anti-government activity. Several of these individuals had spoken about military type action against the current government. Many other organizations besides these that have the potential to use violence exist in parts of Montana and across the country.

History

Fortunately, Deer Lodge County has not been the target of any major terrorist attacks. Some small local level events, however, have required a government response. On April 20, 1992, a pipeline worker was injured while repairing a Montana Power Company natural gas pipeline leak near Warm Springs. The leak was intentionally caused by individuals drilling the pipes during a union dispute and riots. In 1987, the graduation of Anaconda High School was disrupted by a bomb threat and over the course of two years, 27 threats were made to the high school.

Probability

With very little experience and data locally on this hazard, a specific probability is hard to determine. Based on the historical record and the terrorism threat present for the area, the probability of a large scale terrorism or civil disturbance event is considered low.

Mapping

Anaconda is the most populous part of Deer Lodge County. This area, with close proximity to hazardous material facilities and government buildings, could be considered the area at greatest risk for terrorism. Domestic and international terrorism can be hard to predict, and therefore, specific targets are not easily identified. The critical facilities are determined to be at greatest risk due to their importance in sustaining government services.

Associated Hazards and Other Factors

Any hazard that can be “created” can be the result of terrorism or civil disorders. For example, dam failure can be the result of a terrorist act of compromising the dam. Other examples include communicable disease, aviation, ground, and railroad accidents, hazardous materials release, utility failure, wildfire, and urban fire. All of these hazards could be the result of a terrorist act, if intentionally triggered.

Vulnerability

Critical Facilities

Critical facilities in Deer Lodge County are considered to be at greatest risk from terrorism and civil disorders. Often, terrorists target facilities that are highly important for government services and community stability or are particularly vulnerable. Threat data is not specific enough to identify what facilities are most vulnerable, therefore, all critical facilities are considered to have the same risk countywide.

Potential Losses

Structure losses are possible from terrorism and civil disorders but are not likely. Often the losses are at critical facilities or to the population. Looting, however, can be commonly found in association with these types of events. Therefore, this hazard places both the population and property at risk. Urban areas and places of public gathering are generally going to be the areas of greatest risk.

Potential Population Impacts

The effects of terrorism and civil disorders are usually felt by the population. The greatest risk is to human lives during times of unrest. Terrorists typically try to make a dramatic impact that will generate media interest. Attacking the population through a large loss of life is a common tactic. Therefore, the greatest vulnerability from terrorism is to human life and the economy.

Impact of Future Development

Development should have little to no impact on the terrorism and civil disorders hazard, except for the increase in population and the increased potential for life and property losses should an event occur. The location of the development should have little effect on any events.

Data Limitations

Since terrorism and civil disorders are such isolated events and little history exists in Deer Lodge County, the probability and potential losses are difficult to quantify. Therefore, generalities have been made to estimate where potential losses could be.

UTILITY and COMMUNICATIONS OUTAGE

Description

Utility and communications outages can be caused by almost any of the hazards described in this risk assessment, but they can also occur because of human error or equipment failures. Electric, gas, telephone, and water services are all important services that could become problematic should a long term outage occur. Electricity is used to power many homes in Deer Lodge County and is used to pump wells and run heating systems for many homes even if it is not the primary fuel source. Therefore, if electricity was lost for a long period of time, many residents could be without heat, water, and other appliances. Vulnerable populations needing powered medical equipment would be additionally threatened by a long term power outage. Natural gas is used as a heat source for many residents in the Anaconda area. Should that utility be lost in the winter months, the concerns associated with extended cold would be of particular concern. Telephone services are most critical for 911 communications. Residents would lose their ability to call 911 in an emergency if telephone service is lost. Usually, cell phone service is lost too since the towers communicate through phone lines. Water services are provided through public water systems in many of the larger communities in Deer Lodge County. Should those services be lost, many citizens would be without water and possibly sewer services. Any of these disruptions can be easily managed if the outage is only for a short time but can quickly become problematic in long term situations.

History

Power outages are a common event and can be the result of many causes such as lightning, transformer problems, and blown or weighted down lines. On most occasions, the power is quickly restored and causes little problems. One recent communications event is notable, however.

April 21, 1005. A fiber optic line near Helena was accidentally cut, and telephone, Internet, and cell phone services were lost for a period of about two hours. Most of Deer Lodge County including Anaconda, Warm Springs, and Opportunity were affected.⁴⁴ Anaconda Community Hospital had to rely on a satellite telephone provided by law enforcement for Life Flight operations.

Probability

Due to the lack of major historical events, the probability of a significant utility outage in Deer Lodge County is considered low. While the demand on our public utilities and communications is increasing, the technology and protection of that infrastructure is also improving. Should an event occur in Deer Lodge County, the probability that other counties or the entire region would be affected is high.

Mapping

Digital mapping of the Anaconda-Deer Lodge County utility infrastructure is not readily available as the county does not have a GIS function. Electric, gas, and telephone infrastructure mapping is maintained by the private owners of the systems. As standard policy, this data is for internal use only. The location of key infrastructure is withheld to prevent malicious use of such sensitive data.

⁴⁴ Associated Press, Fiber Optic Line Cut near Helena, Causes Phone Outages in Missoula, Butte, April 21, 2005.

Associated Hazards and Other Factors

Utility failures can be caused by many of the hazards described in these profiles. Anything from an earthquake to a terrorist event could cause utilities to fail. Events that utility systems are particularly vulnerable to include earthquakes, floods, severe thunderstorms, tornadoes, high winds, winter storms, wildfires, and dam breaks. Underground water systems can crack during earthquakes or freeze in cold weather. The water supply is particularly vulnerable to contamination from flood waters or wildfire silt runoff. Residents have also raised the specific concern of flooding and failure of the waste water treatment facility. Above ground electric and telephone infrastructure is vulnerable to high winds, heavy snow loads, wildfire, and terrorism. Most natural gas lines are buried and vulnerable to cracking during an earthquake. Some gas lines, however, are exposed, and therefore, are vulnerable to additional hazards.

Vulnerability

Critical Facilities

Critical facilities are vulnerable to utility outages. Only a few facilities such as the Law Enforcement Center have back-up generators in case of an electricity outage. All others would have limited functionality without electricity. Most critical facilities, except for those in the outlying areas, are connected to the public water system. Disruption of telephone services would limit emergency communications to radio and satellite transmissions. Of particular concern are the shelters in a long term utility outage, particularly if one occurs during an extended cold weather period.

Potential Losses

Utility failures typically do not impact structures directly. Services to residential and commercial buildings could be lost, and therefore the functionality of the water and heating systems could be disrupted. One of the greatest losses would be to the economy. Many businesses require electricity, water, and telephone services to operate. Should a utility failure extend for several days, the business losses could be significant. Roughly 58% of the county's economy is retail trade with an additional 14% in accommodations and food service. This sector of the economy could be severely impacted by a utility outage.

Potential Population Impacts

Without public utility services such as heat and drinking water, the population could suffer should the outage occur for a long period of time. Significant casualties would not be expected since these services would possibly be available in a nearby community. If not, outside resources could be reasonably expected within a few days before serious impacts of the utility loss were felt by the majority of the public. Significant relocations of vulnerable populations and disruption of normal lifestyles would be expected.

Impact of Future Development

Future development is not expected to have significant impacts on this hazard. Increased populations add to the challenges of managing a long term utility outage but would not increase the damages necessarily.

Data Limitations

Since long term utility outages are not a normal event for Deer Lodge County, understanding the specific problems and concerns of this hazard are the greatest limitation. The lack of utility mapping available for analysis also limits evaluating the probability of a utility failure and the potential areas that could be affected.

VOLCANO

Description

Active volcanoes are not present in Deer Lodge County, but past eruptions have affected the county, and the possibility of an eruption in nearby Yellowstone National Park always exists. The active volcanic areas in the Cascade Range such as Mt. St. Helens, Mt. Rainer, and Mt. Hood are hundreds of miles to the west of Deer Lodge County but are still within reasonable range of ash fall, especially considering the usual upper atmospheric wind patterns. Theoretically, these volcanoes could deposit ash several inches thick over Deer Lodge County and any large eruption could change the weather patterns experienced globally.

Yellowstone, one of the world's largest active volcanic systems, has produced several giant volcanic eruptions in the past few million years, as well as many smaller eruptions and steam explosions more recently. Although no eruptions of lava or volcanic ash have occurred for many thousands of years, future eruptions are likely. In the next few hundred years, hazards will most probably be limited to ongoing geyser and hot-spring activity, occasional steam explosions, and moderate to large earthquakes. To better understand Yellowstone's volcano and earthquake hazards and to help protect the public, the U.S. Geological Survey, the University of Utah, and Yellowstone National Park formed the Yellowstone Volcano Observatory, which continuously monitors activity in the region.⁴⁵

If a large caldera-forming eruption were to occur at Yellowstone, its effects would be worldwide. Thick ash deposits would bury vast areas of the United States, and injection of huge volumes of volcanic gases into the atmosphere could drastically affect global climate. Fortunately, the Yellowstone volcanic system shows no signs that it is headed toward such an eruption. The probability of a large caldera-forming eruption within the next few thousand years is exceedingly low. Any renewed volcanic activity at Yellowstone would most likely take the form of such mainly non-explosive lava eruptions. An eruption of lava could cause widespread havoc in the park, including fires and the loss of roads and facilities, but more distant areas would probably remain largely unaffected.⁴⁵

History

In May 1980, the eruption of Mount St. Helens sent ash high into the atmosphere. Approximately one inch fell across Deer Lodge County. Public offices, including the prison and schools, were closed, and driving was not permitted for two days while the ash was cleaned up.

Historical studies have shown that ash from Glacier Peak 11,200 years ago and Mount Mazama 6,600 years ago also fell in Deer Lodge County.¹¹ The Yellowstone region has produced three exceedingly large volcanic eruptions in the past 2.1 million years. In each of these cataclysmic events, enormous volumes of magma erupted at the surface and into the atmosphere as mixtures of red-hot pumice, volcanic ash (small, jagged fragments of volcanic glass and rock), and gas that spread as pyroclastic ("fire-broken") flows in all directions. Rapid withdrawal of such large volumes of magma from the subsurface then caused the ground to collapse, swallowing overlying mountains and creating broad cauldron-shaped volcanic depressions called "calderas."⁴⁵

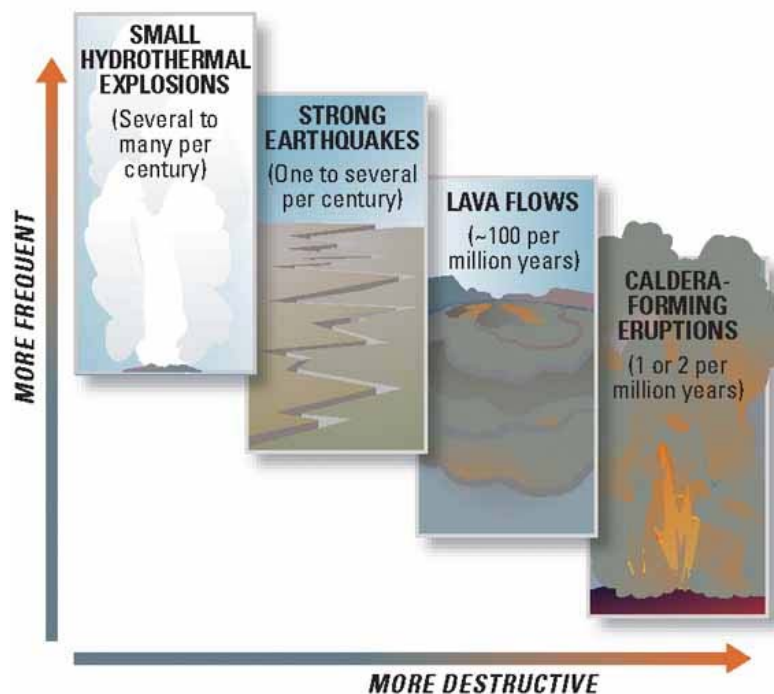
⁴⁵ US Geological Survey. Fact Sheet 2005-3024, Steam Explosions, Earthquakes, and Volcanic Eruptions – What's in Yellowstone's Future?. 2005.

Probability

Volcanic eruptions are rare events when considered in comparison to other hazards measured on the 100-year scale. The Montana Hazard/Vulnerability Analysis from 1987 estimates the return period of substantial volcanic ash fallout in Deer Lodge County to generally once every 5,000-8,000 years.¹¹

Scientists evaluate natural-hazard levels by combining their knowledge of the frequency and the severity of hazardous events. In the Yellowstone region, damaging hydrothermal explosions and earthquakes can occur several times a century. Lava flows and small volcanic eruptions occur only rarely - none in the past 70,000 years. Massive caldera-forming eruptions, though the most potentially devastating of Yellowstone's hazards, are extremely rare - only three have occurred in the past several million years. U.S. Geological Survey, University of Utah, and National Park Service scientists with the Yellowstone Volcano Observatory (YVO) see no evidence that another such cataclysmic eruption will occur at Yellowstone in the foreseeable future. Recurrence intervals of these events are neither regular nor predictable.⁴⁵ Figure 4.55 shows the probability of the various events that can occur in Yellowstone National Park.

Figure 4.55 USGS Graphic Depicting Recurrence Intervals for Geological Events in Yellowstone National Park⁴⁵



Mapping

The areas affected by volcanic eruptions are dependent on the type of eruption and the prevailing wind direction. In an actual event, models would be used to estimate the areas predicted to receive ash and other effects from the volcano. Therefore, mapping hazard areas would be broad generalizations and will not be completed here.

Associated Hazards and Other Factors

Volcanoes, a geological feature, are closely related to earthquake activity. Often eruptions are preceded by earthquake activity as magma moves below the surface. The two events are usually closely linked and monitored. Other factors that become important during a volcanic eruption including wind speed, direction, and rainfall. The wind speed and direction will dictate when and where ash falls. Dry ash is manageable, but when combined with rainfall, the ash becomes glue-like and much more difficult to control.

Vulnerability

Critical Facilities

All critical facilities are at risk from volcanic eruptions. The impact on the facilities will depend on the amount of ash that falls and the ability to remove it. Significant amounts of ash have the potential to clog air systems and shut down facilities. Given enough wet, heavy ash, the potential exists for roofs to fail. Infrastructure exposed to the ash fall, such as power systems, could be brought down by the ash as well. The removal of ash from government facilities and infrastructure could potentially create costs beyond the community's capabilities.

Potential Losses

During Mt. St. Helens, the greatest costs came from the difficult task of removing volcanic ash. The greatest threat is not necessarily to people or residences but to property such as vehicles and equipment. The volcanic dust is corrosive to metals and without proper removal can certainly cause damages to public and private property. The potential exists, although unlikely, that a large amount of ash, if combined with rainfall, could be heavy enough to collapse roofs and cause structural damage. The economy could also be negatively affected. In the case of Mount St. Helens, travel in the county was restricted for two days while crews cleaned up.

Potential Population Impacts

Light ash fall does not typically impact the population. The first to be affected are usually the elderly and those with respiratory problems. Often the public is instructed to remain indoors with windows and doors closed. Should a heavy ash fall condition exist for several days, more significant health problems could result. Pyroclastic flows that can destroy everything in their paths would not impact Deer Lodge County due to its distance from active volcanoes.

Impact of Future Development

Future development will have little to no effect on the volcano hazard vulnerability. An increase in the population and number of structures would increase the exposure.

Data Limitations

Volcanic eruptions that affect Deer Lodge County are so extremely rare that documenting the potential impacts and probability is very limited. Continued study of the Yellowstone caldera and other volcanic areas will hopefully allow scientists, and therefore emergency managers, to better understand this hazard.

WILDFIRE

Description

Wildland fires are a part of nature in mountainous, forested areas of Montana, and Deer Lodge County is no exception. Grass fires are also common in our non-irrigated fields and open areas due to the arid climate during almost any season but winter.

A wildland fire can be categorized as either an uncontrolled fire in a forested/heavily vegetated area or in a grass area. Both types of wildfires have the potential to destroy structures and natural resources while producing heavy amounts of smoke. Wildfires can be caused by any flame source but most often are triggered by lightning, human carelessness, arson, or train sparks. Once triggered, the ambient conditions will dictate whether the fire will spread or not. Moist, cool, calm conditions or low fuels will suppress the fire, whereas dry, warm, windy conditions or heavy fuels will contribute to fire spread. The natural environment has evolved to live with fire. New growth occurs in a matter of a few years and some species require fire to germinate.

Problems with wildfire occur when combined with the human environment. People and structures near wildfires are threatened unless adequately protect through evacuation or mitigation. Most structures are flammable, and therefore, are threatened when wildfire approaches. In addition, a significant loss of life could occur with residents who do not evacuate, firefighters, and others who are in the wildfire area. Our infrastructure such as electric transmission lines, fuel tanks, and radio transmission towers are not often equipped to withstand the heat from a wildfire. Timber resources, animal habitats, and waterways can all be damaged leading to negative economic and environmental impacts. Where human development meets undeveloped, vegetative lands is considered the wildland/urban interface (WUI).

Deer Lodge County is regularly threatened by wildfires because of the terrain, climate conditions, and fuels present. Deer Lodge County has a large area of government owned lands, including parts of the Beaverhead/Deerlodge National Forest - Wise River and Philipsburg Districts, Mount Haggin Wildlife Management Area, Lost Creek State Park, and Anaconda Smoke Stack State Park managed by Montana Fish, Wildlife, and Parks, Regions 2 and 3, and Montana School Trust Lands.

Fuels in Deer Lodge County range from dense timber stands in varying terrain to native grasslands. Douglas fir, lodgepole pine, Engelmann spruce, sagebrush, rough fescue, and other grasses make up many of the wildland fuels in the county. Periods of drought, disease, insect infestations, and low fire activity or mitigation may all lead to an increase in hazardous fuels.

History

Deer Lodge County has a long history of wildfires from small to large. Some have caused damages and others have not. The extent of damages often depend on the fire spread rate and the effectiveness of suppression and mitigation measures. The history of wildfires can be difficult to compile because of the various firefighting entities involved and a variety of recordkeeping measures over the years. Table 4.56 lists the large wildland fires recorded by Montana Department of Natural Resources and newspaper archives. Note many fires in from the 1930's through the 1960's are missing due to little historical tracking during that time period.

Table 4.56 Large Wildland Fires in Deer Lodge County, Montana

Fire Name	Acres	Date	Legal Location	Resources Threatened*
Twin Lakes	93	8/10/2003	NESW S4 T4N R13W	Residences, Water System Flume
Garrity	55	10/13/2002	SE S33 T5N R12W	
Whitetail Park	70	6/30/2000	SENE S19 T5N R9W	
Six Mile	20	10/21/1999	SENE S26 T3N R12W	
Foster Creek	30	8/23/1999	NWNW S17 T5N R12W	Anaconda Job Corps Center
Opportunity	30	2/10/1992	NWNE S9 T4N R10W	Country Club Golf Course
Willow Divide	50	10/22/1988	SENE S13 T3N R11W	
Girard Gulch	140	8/19/1988	SWSW S19 T5N R8W	Residences, One Burned
Big Hole	20	8/11/1986	NESW S18 T1N R13W	
Hoodoo Mountain	39	7/7/1985	SESE S11 T5N R11W	
American Creek	30	9/19/1984	SESE S10 T2N R11W	
Dutchman	1,214	4/21/1983	SE S29 T5N R10W	Airport, Montana State Hospital
Willow Glen	335	9/18/1979	S21 T4N R10W	
Barker Creek	3,300	8/4/1979	S7 T4N R12W	Numerous Residences, Watershed
Moose Creek	43	10/22/1977	S12 T2N R12W	
Fish Trap	110	4/22/1977	S34 T2N R13W	
White Pine Creek	20	6/24/1974	S15 T3N R10W	
7 Mile Corral Creek	48	8/12/1973	S27 T3N R12W	
A Hill	37	8/14/1973	S9 T4N R11W	Residences
California Creek		8/26/1931		
Silver Lake		7/23/1931		
German Gulch		8/12/1910		
North of the City		9/25/1895		
Elliston		10/10/1889		
Georgetown and Silver Lakes		9/15/1889		
Big Hole		9/10/1889		
Combination Mining Company		9/4/1889		

*If nothing is listed, then only natural resources (timber, grass) were threatened and damaged.

Sources: Fires greater or equal to 20 acres on county or State protected lands for 1973-2003 were provided by Montana DNRC, Anaconda Office. Earlier fires were collected from Anaconda Standard Newspaper Archives.

In 1994, Montana Department of State Lands determined the fire start history for the high risk areas in Deer Lodge County. Table 4.57 shows the fire start history by area.

Table 4.57 Wildfire History By Area for Deer Lodge County from 1984-1993⁴⁶

Location	History
Georgetown Lake East	1.2 Fires/1,000 Acres/10 Years
Yankee Flats	0.95 Fires/1,000 Acres/10 Years
Foster/Barker Creek	0.75 Fires/1,000 Acres/10 Years
Clear Creek	0.72 Fires/1,000 Acres/10 Years
Warm Springs Creek	0.72 Fires/1,000 Acres/10 Years
Georgetown Lake South	0.63 Fires/1,000 Acres/10 Years
Olson Gulch	0.62 Fires/1,000 Acres/10 Years
Perkins Gulch	0.53 Fires/1,000 Acres/10 Years
Silver Lake	0.52 Fires/1,000 Acres/10 Years
Fairmont	0.50 Fires/1,000 Acres/10 Years

⁴⁶ Montana Department of State Lands, Southwestern Land Office, Anaconda and Garrison Units, Risk Rating for Wildland/Urban Interface Fire Planning. Summer 1994.

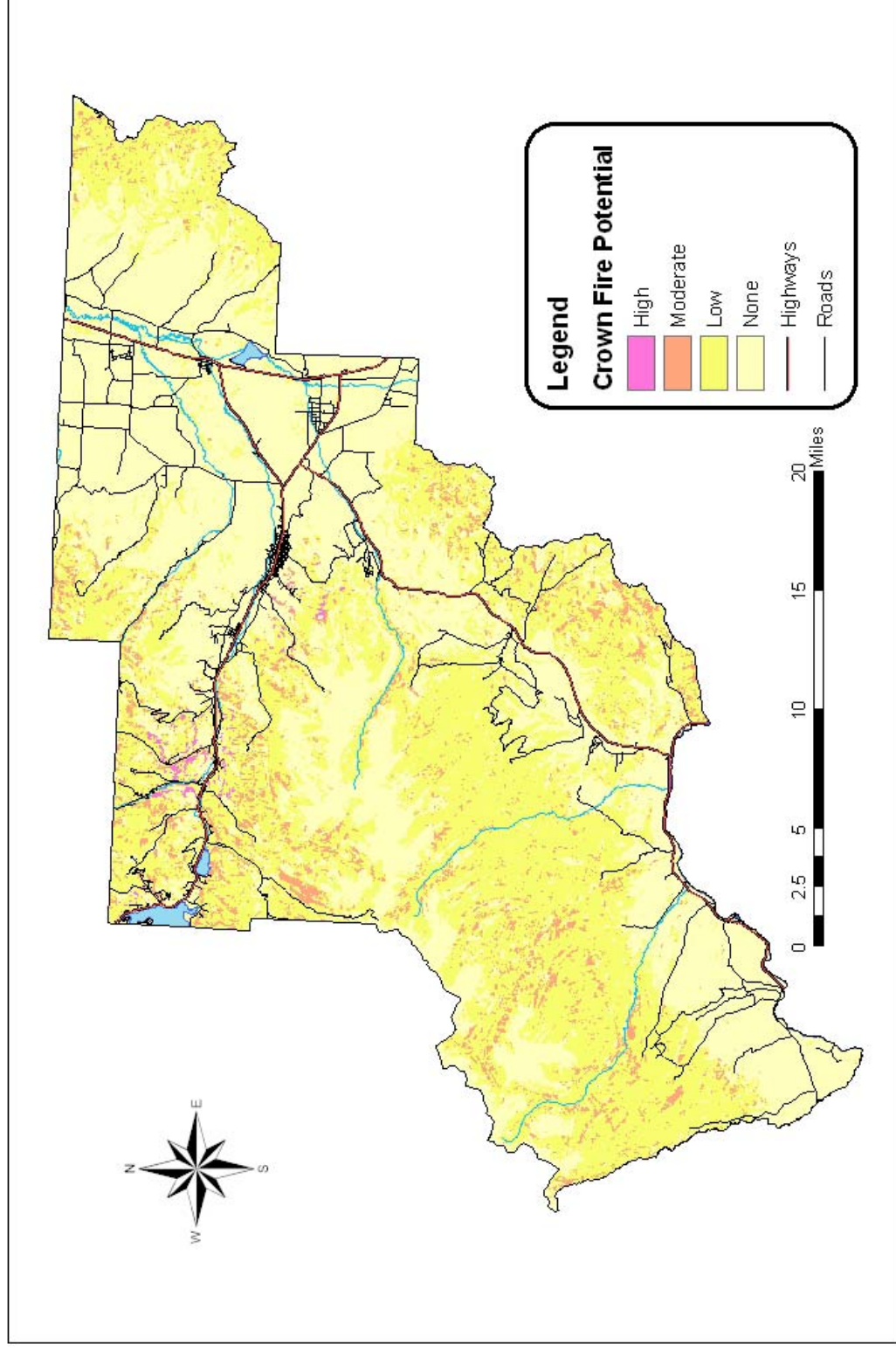
Probability

Since 1973, 19 large wildfires have been noted in Deer Lodge County. Years of fire suppression have resulted in unnatural, heavy fuel conditions. Homes and summer camps have popped up in forested areas where none used to be. Therefore, the probability of a damaging wildfire appears to be increasing. Using the historical record, the probability of a large wildfire is 59% in any given year or roughly one every other year (19 fires/32 years).

Mapping

Map 4.58 shows the crown fire potential in areas identified by the US Forest Service. The US Forest Service has found that the potential for damaging wildfires is most directly related to the crown fire potential. Therefore, the map shows the estimated risk for areas within the County. This mapping was primarily done for Forest Service areas, and therefore, other parts of the County may be additionally threatened and not mapped. A Community Wildfire Protection Plan currently under development may contain a better assessment of the hazard areas.

Deer Lodge County, Montana Crown Fire Potential



Data Source: US Forest Service, Region One

Associated Hazards and Other Factors

As if a raging wildfire isn't bad enough, the charred ground and thick smoke plumes it produces can create other hazards. The heavy smoke produced by a wildfire can cause unhealthy air conditions that may affect those with respiratory problems and otherwise healthy people. The air conditions are often monitored and alerts may be issued. Smoky conditions can also lead to poor visibility and an increased probability of ground transportation or aircraft accidents. Besides air pollution, water pollution may also occur during and after a wildfire. Many watersheds in wildland areas serve as the public water supplies for area communities. Should a significant wildfire pass through the area, pollution of the watershed can occur. With vegetation removed and the ground seared from a wildfire, the area also becomes more prone to flash floods because of the ground's reduced ability to hold water. Wildfires can have an impact on the regional economy with the loss of timber, natural resources, recreational opportunities, and tourism, all of which are of particular importance in Deer Lodge County.

Vulnerability

Critical Facilities

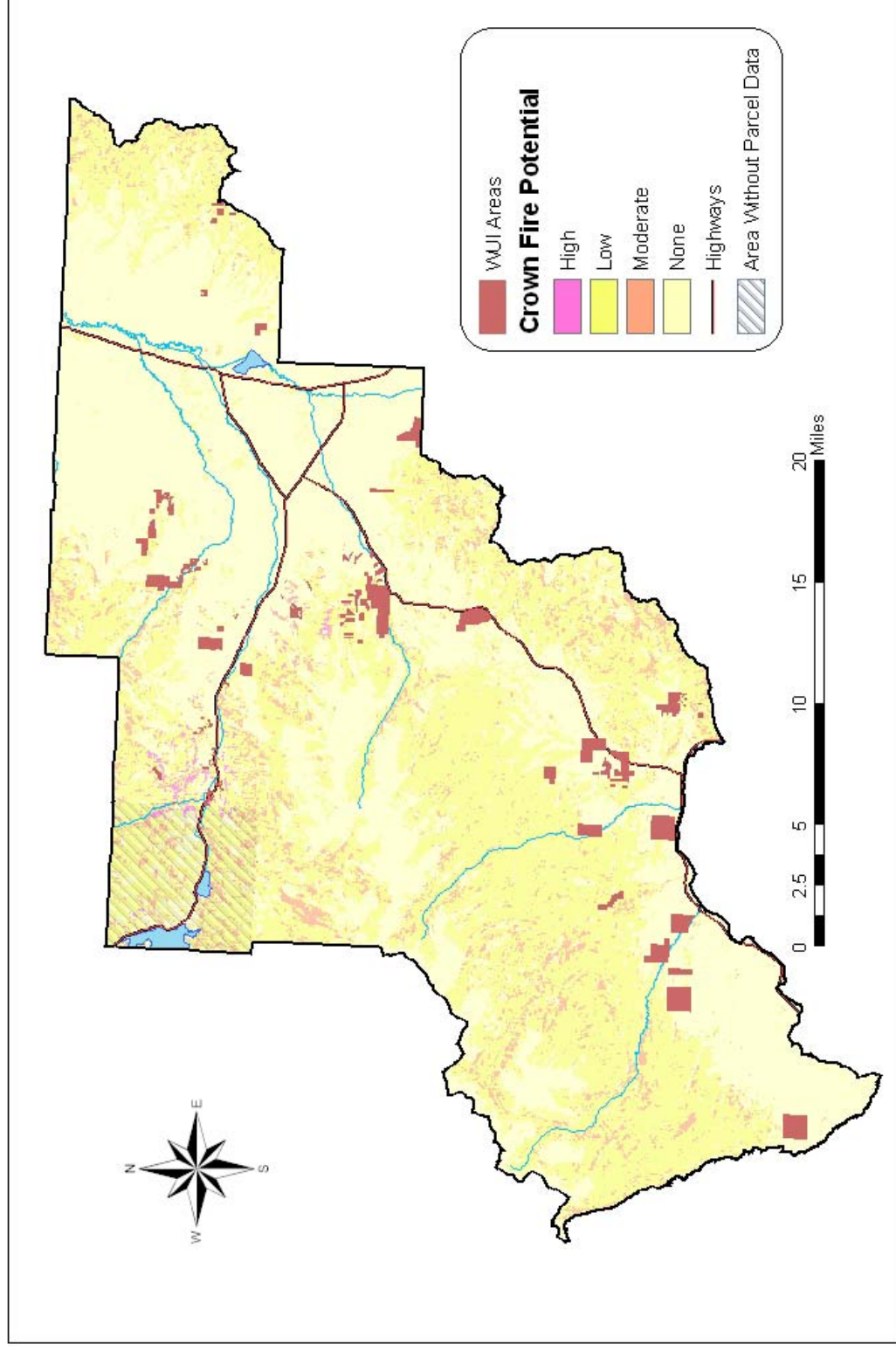
The critical facilities in the wildland urban interface with crown fire potential include the Georgetown Lake Fire Stations (one each in Deer Lodge and Granite Counties), the Anaconda Job Corps, and the Montana DNRC Offices. The Georgetown Lake Fire Stations and Montana DNRC Offices are particularly critical to fighting wildfires in the area. The Montana DNRC Offices have defensible space. The Anaconda Job Corps is an active work development site and is populated year round.

Potential Losses

Wildfires have the greatest potential to substantially burn National Forests and State acreage, however, private residences become threatened when the fire enters the wildland/urban interface. Deer Lodge County has many wildland/urban interface areas that may be threatened should a wildfire encroach. Using the crown fire potential map in conjunction with parcel data, an estimate of the number of structures in the interface was derived. Approximately 445 structures are located in the wildland/urban interface (WUI). Note that this figure is purely an estimate based on available GIS data. The Community Wildfire Protection Plan, once completed, will have a more accurate assessment of the potential losses from this hazard. Using the state tax assessment data, the total value of these structures is estimated at \$29,531,424. As Map 4.59 shows, the WUI areas are widespread across the county. The only WUI area not shown on Map 4.59 is the Georgetown Lake area that does not have parcel data. The Georgetown Lake Fire Chief estimates roughly 182 structures are in the Deer Lodge County WUI. Additionally, Georgetown Lake is a popular recreation area undergoing rapid, high value development. The Georgetown Lake Fire Department protects an area of 55 square miles, including Georgetown Lake and currently 70 lots for condos are proposed in one residential development.

A damage factor is rather difficult to determine because the losses will be highly dependent on the fire characteristics and its location. Not all areas will be affected by one wildfire. Losses in the area of the WUI fire, however, could have a high loss rate. Given the assumption that 15% of the structures in the total WUI could be lost in a probable wildfire, the structure losses from that fire would roughly total \$4.5 million dollars with 67 structures affected.

Deer Lodge County, Montana Wildland Urban Interface



Data Source: US Forest Service, Region One

In 1994, Montana Department of State Lands scored and ranked many sections of Deer Lodge County for wildfire. Ratings include extreme, very high, high, moderate, and low. Table 4.60 shows the results of that prioritization.

Table 4.60 Wildland Urban Interface Risk Rating⁴⁶

Location	Rating	Description
Clear Creek	Extreme 176	South of Anaconda on Highway 274; Gated area; Lower homes in grass and deciduous fuels, upper homes in dense lodgepole along Clear Creek
Perkins Gulch	Extreme 174	East of Warm Springs, accessed by Perkins Gulch Road (lower area) and Cottonwood Creek Road (upper area); Structures are located in sections 17 and 19
Foster/Barker Creek	Extreme 172	7 miles west of Anaconda; North end of Barker Creek and south end of Foster Creek; Forest Service run Job Corps in Foster Creek accounts for most of the wood shake roofs
Warm Springs Creek	Very High 167	North of Highway 1 by Spring Hill; Of 18 residences, 3 meet landscape requirements and 3 have wood shake roofs
Yankee Flats	Very High 165	8 miles west of Anaconda; Majority of homes in lodgepole pine stands on South side of Highway 1; 13% of homes met landscape requirements
Georgetown Lake East	Very High 151	Lake frontage; Georgetown and Southern Cross; Of 156 residences, 49 meet landscape requirements and 14 have wood shake roofs
Georgetown Lake South	High 147	Dense clusters; Close to Georgetown Lake; Steep grade on roads off of Vagabond Lane in the Dude Ranch area; Of 253 residences, 41 meet landscape requirements
Silver Lake	High 141	East of Georgetown Lake along MT Highway 1; Includes Lager Gulch and Camp Silvercloud (Girl Scout Camp) with 13 structures
Fairmont	High 137	Fairmont off I-90 or Highway 441; A few homes that do not meet landscape requirements in Gregson Creek and Whitepine Creek draws; Of 53 houses, 37 meet landscape requirements and 39 have fire resistance roofing material
Olson Gulch	High 136	6 miles west of Anaconda; Of 29 homes, 9 meet landscape standards

Although the primary concern is to structures and the interface residents, most of the costs associated with fires, come from firefighting efforts. Additional losses to natural resources, water supplies, air quality, and the economy are also typically found. As past events have also shown, infrastructure such as power transmission lines can be threatened.

Potential Population Impacts

Using the estimate of 67 structures affected in a major wildfire from the Potential Losses section, roughly 127 people would live in the affected area (65 structures x 1.9 people/structure). In many cases, residents can be evacuated before the fire moves into their area. Some residents, however, may choose to remain in the evacuated area or a rapidly spreading fire may not allow enough time for a formal evacuation. Firefighters can also be particularly threatened during wildfires. For these reasons, the impact on the population can be considered moderate.

Impact of Future Development

The wildland/urban interface is a very popular place to live as national trends show. More and more homes are being placed in this interface, particularly in Montana, and Deer Lodge County is no exception. The overall growth picture in Deer Lodge County shows that very little growth is occurring, but when further reviewed, the wildland/urban interface areas are seeing significant development while other parts of the county are losing population. Therefore, although Deer Lodge County as a whole is not experiencing net growth, the sections of the county area that are growing are the interface areas.

The development is increasing the number of structures, infrastructure, and population at risk from wildland fires. In an effort to mitigate potential impacts from future wildfires, the Georgetown Lake Development District requires wildfire prevention plans and mitigation under the County Development Permit System. The Anaconda-Deer Lodge County Subdivision Regulations give the governing body the authority to require fire fighting facilities. Under these same regulations, subdivisions are not prohibited in high fire hazard areas (as determined by the US Forest Service or Montana Department of Natural Resources and Conservation), but must conform to special standards. These special standards include two entrance/exit roads, the road right of way be cleared of slash, and bridges be designed for loads of 20 tons and constructed from non-flammable materials. Structures are prohibited on slopes greater than 25% and on specific topographical features. Table 5.61 shows the minimum lot sizes.

Table 5.61 Minimum WUI Subdivision Lot Sizes⁷

% Slope	Open Grass	Forest & Brush
0-10	1 acre	2 acres
10-20	2 acres	3 acres
20-25	3 acres	4 acres
Over 25	5 acres	Not permitted

The subdivision regulations also contain water supply requirements⁷:

- 500 gallons/minute for lots one acre or more
- 750 gallons/minute for lots one acre or less with no central water
- 500 gallons/unit with a minimum of 4,000 gallons available

Data Limitations

The wildland/urban interface can be defined in many ways to included areas of flammable grasses or steep slopes. For the purposes of this analysis, areas with the potential for crown fires were used to define the interface. A more detailed study, using field analysis techniques, would allow for better wildland/urban interface exposure and potential loss estimates. Deer Lodge County is currently writing a Community Wildfire Protection Plan that will better outline the wildfire hazard.

WIND, TORNADOES, and SEVERE THUNDERSTORMS

Description

Thunderstorms in Montana develop when moisture in the air rises, often from daytime ground heating, an unstable atmospheric condition, synoptic front, or by terrain uplift, and cools higher in the atmosphere, condensing into rain droplets or ice crystals. The cloud grows as these conditions continue and the atmospheric instability allows. Lightning can be produced, with or without rain, as a charge builds up in the cloud. With the right atmospheric conditions, updrafts and downdrafts form in the thunderstorm structure. These strong updrafts and downdrafts can produce hail, strong straight-line winds, and even tornadoes.

Hail is produced when a supercooled droplet collects a layer ice and continues to grow, sustained by the updraft. Once the hail stone cannot be held up any longer by the updraft, it falls to the ground. Deer Lodge County regularly has small, pea-sized hail, but larger stones to the size of quarters or larger are possible.

Strong straight-line winds, sometimes stronger than tornadoes at over 100 mph, occur when air is carried into a storm updraft, cools rapidly, and comes rushing to the ground. Cold air is denser than warm air, and therefore, wants to fall to the surface on warm summer days when the cold air can no longer be supported up by the storm's updraft. These winds are forced horizontally when they reach the ground and can cause significant damage.

Tornadoes form when the right amount of shear is present in the atmosphere and causes the updraft and downdraft to rotate. A funnel cloud is the rotating column of air extending out of a cloud base, but not yet touching the ground. The funnel cloud does not become a tornado until it touches the ground. Once in contact with the surface, it can create great damage over a small area. Although rare, they can and do occur in Montana.

A severe thunderstorm is defined by the National Weather Service as a thunderstorm that produces wind gusts at or greater than 58 mph, hail $\frac{3}{4}$ " or larger, and/or tornadoes. Although not considered severe by definition, lightning and heavy rain can also accompany thunderstorms. The severe conditions are often the events that can directly cause widespread damage. Strong winds, hail, and tornadoes have capability to damage structures, infrastructure, crops, livestock, and vehicles.

High winds can also occur outside thunderstorms with strong pressure gradients and gusty frontal passages. High wind warnings are issued when winds are expected to be sustained at 40 mph or greater for at least one hour or gusts 58 mph or greater. Wind advisories are issued when sustained winds are expected at 30 mph or greater for at least one hour or longer or gusts over 45 mph.

History

Table 4.62 Severe Weather Reports for Deer Lodge County, Montana since 1950⁴⁷

Date	Location	Type	Speed or Size	Damages
6/16/1959	Deer Lodge County	Hail	1.00 inches	
7/19/1968	Deer Lodge County	Thunderstorm Wind	100 mph	
6/8/1988	Deer Lodge County	Thunderstorm Wind	63 mph	
7/5/1988	Deer Lodge County	Thunderstorm Wind	69 mph	
7/20/1989	Deer Lodge County	Thunderstorm Wind	Unknown	
8/8/1990	Deer Lodge County	Thunderstorm Wind	Unknown	
11/3/1993	Anaconda	High Winds	Unknown	Damage reported
6/6/1994	Anaconda	Hail	0.88 inches	
4/10/1996	Anaconda	Hail	0.75 inches	
4/19/1996	Anaconda	Hail	0.75 inches	
6/6/1997	Warm Springs	Lightning	N/A	Lightning struck the Opportunity Store, started a fire, and a significant amount of unknown sized hail fell
9/15/1997	Opportunity	Tornado	F0	A 50 yard wide, magnitude F0 tornado touched down near Opportunity
7/3/1998	3 miles W of Anaconda	Hail	1.50 inches	
7/11/1998	Anaconda	Thunderstorm Wind	69 mph	Three cars were destroyed and two people hospitalized with minor injuries. About 20 trees were blown down in Washoe Park.
8/6/1998	Anaconda	Thunderstorm Wind	70 mph	Wind gusts estimated up to 70 mph broke windows and tore siding off a few homes. Highway signs were also knocked over.
8/7/1998	Anaconda	Hail	1.75 inches	Public reported golf ball sized hail near Georgetown Lake between 320 PM and 330 PM MDT.
8/21/1999	Anaconda	Hail	0.75 inches	
8/4/2001	3 miles W of Anaconda	Hail	0.75 inches	
6/21/2002	Anaconda	Funnel Cloud	N/A	
8/21/2002	Anaconda	Hail	0.75 inches	

⁴⁷ National Climatic Data Center, Local Storm Reports, <http://www.ncdc.noaa.gov/oa/ncdc.html>.

Probability

The history of hail and strong thunderstorm winds in Deer Lodge County shows that both are fairly frequent. The data presented in the history is based on reports received by the National Weather Service in Missoula, MT. Therefore, many events may not have been reported or noted by observers. Since recent data appears to be the most accurate, the following statistics can be presented based on the data since 1988.

Tornadoes:

- 1 confirmed F0 tornado since 1988
- 1 reported funnel cloud since 1988

Hail:

- 8 severe hail events since 1988
- Annual average = 0.5 events or 1 event every 2 years
- Largest reported size = 1.75 inches

Thunderstorm Winds:

- 6 severe thunderstorm wind events since 1988
- Annual average = 0.4 events or 1 event every 2.5 years
- Highest reported thunderstorm wind speed = 100 mph

Figures 4.63 and 4.64 show the frequency of severe thunderstorm events by month. July and August are the months when most severe thunderstorms occur.

Figure 4.63 Hail Events, $\frac{3}{4}$ " of Larger, in Deer Lodge County by Month

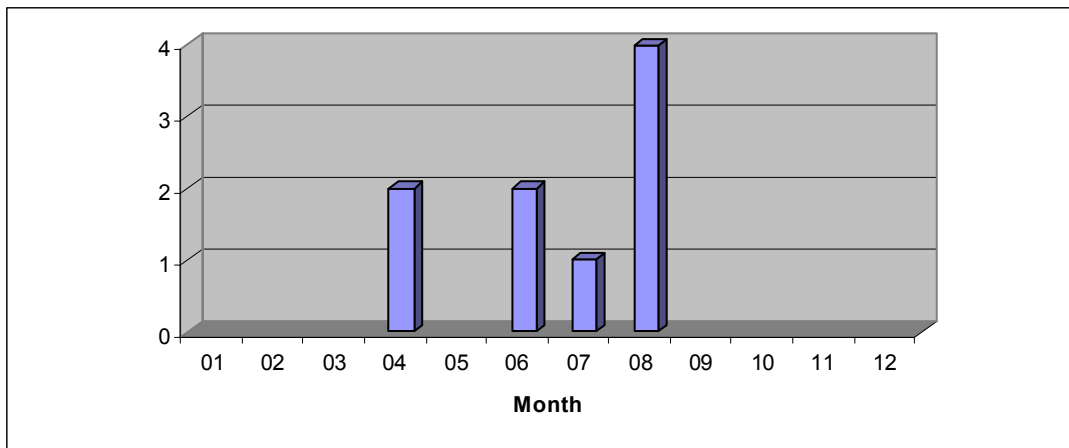
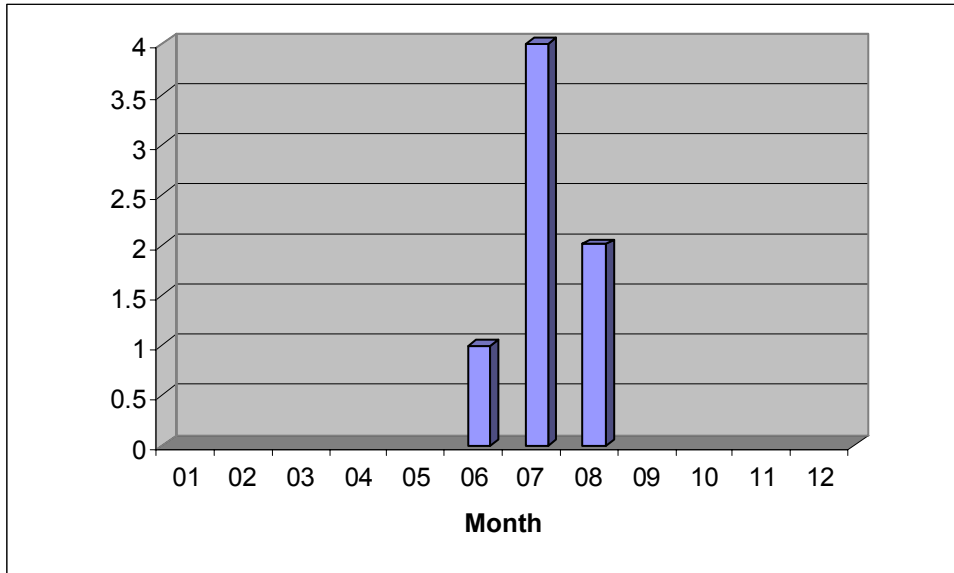


Figure 4.64 Thunderstorm Wind Events, 58 mph or Greater, in Deer Lodge County by Month



Mapping

Severe thunderstorms can occur anywhere in Deer Lodge County. Due to the sporadic population centers in Deer Lodge County, mapping the locations of historical events would show where events have been spotted and reported from, but would not necessarily depict the hazard level from severe thunderstorms. Low traveled areas may have a larger concentration of severe thunderstorm events, but because of the low population, events have gone unreported.

Associated Hazards and Other Factors

Almost any other hazard can be aggravated by high winds. Wildfires and urban fires can spread more rapidly under high wind conditions. Drought conditions can be made worse by winds quickly evaporating ground moisture and causing soil erosion. Avalanches become more likely on wind loaded slopes. Aviation accidents are more likely to occur in windy conditions. Should a utility outage occur in the winter, home heat would be lost more quickly during windy conditions. Warm winds have even lead to more severe flooding by melting the snow pack quicker. Blizzard conditions from blowing and drifting snow can develop with the onset of strong winds. Large hail and tornadoes occur in severe thunderstorms, but frequent lightning often occurs with these storms. Lightning can cause structure fires, utility failure, and wildfires. Heavy rain is almost always found in severe thunderstorms, and therefore, flash flooding can be associated with the other severe events..

Vulnerability

Critical Facilities

All critical structures are considered to have the same vulnerability to wind and severe thunderstorms. Infrastructure, namely power lines, is more vulnerable to high winds and falling trees. Power systems are the most likely infrastructure to fail during a severe thunderstorm. Communications towers may

also topple under strong winds or large hail. Those critical facilities at a reduced risk from severe thunderstorms and tornadoes are those utilities located underground and reinforced structures.

Potential Losses

With the entire county at risk from wind, severe thunderstorms, and tornadoes, estimates of damages are hard to determine. Realistically, an event involving a tornado or severe thunderstorm would most likely affect a small area. If that area, however, was in a developed part of the county, 10-20 homes could be damaged. Fifteen homes at a damage factor of 30% would result in roughly \$318,150 in damages. Vehicles damaged by hail or falling debris would be additional losses. Potential losses could also include losses to agriculture. Livestock and crops can be significantly damaged by hail and wind and profits diminished.

Potential Population Impacts

The National Weather Service in Missoula, MT warns for severe thunderstorms and tornadoes when recognized on Doppler radar or by other means. Some events have 15-20 minutes warning time and others have little to no warning. Depending on the warning issued and the area threatened, the population may or may not be at risk. The numerous campgrounds in the National Forests become particularly vulnerable populations unless the warnings are received and precautions are taken. A NOAA weather radio transmitter is located in Butte and those with specially built receivers can be alerted to weather hazards.

Impact of Future Development

Future development will likely have little effect on the vulnerability to wind, severe thunderstorms, and tornadoes. The risk is assumed to be uniform countywide, and therefore, the location of development does not increase or reduce the risk necessarily. Development and population growth may in fact improve the television and radio technology available to residents, and therefore, improve the warning capabilities.

Data Limitations

Wind, severe thunderstorms, and tornadoes can be such isolated and common events that the vulnerability to a particular area can be hard to determine. Weather data is often limited by the observations taken, and high wind, severe thunderstorm, and tornado events are only recorded if reported to the National Weather Service office. A long-term detailed study using radar analysis over Deer Lodge County could be used to determine the areas at greatest risk for severe thunderstorms. Additional anemometers spread throughout the county with archived data would allow for a more detailed wind analysis.

WINTER STORMS and EXTENDED COLD

Description

Snow storms and bitterly cold temperatures are common occurrences in Deer Lodge County and generally do not cause any problems as residents are used to winter weather and are often prepared for it. Sometimes, however, blizzards can occur and overwhelm the ability to keep roads passable. Heavy snow and ice events also have the potential to bring down power lines and trees. Extreme wind chill temperatures may harm residents if unprotected outdoors or if heating mechanisms are disrupted.

History

Table 4.65 shows the winter weather records for Deer Lodge County.

Table 4.65 Winter Weather Records for Deer Lodge County, Montana²

Location	Period of Record	Low Temperature Record	Daily Snowfall Record
Silver Lake	1950-1983	Not Applicable	24 inches
Anaconda	1982-2004	-38°F, December 24, 1983	18 inches
East Anaconda	1905-1980	-35°F, February 7, 1936	18 inches

Newspaper records demonstrate some of the more significant winter weather events that have affected the community. On January 23, 1900, Anaconda experienced a notable wind and snow event as recalled from newspaper records. On December 15, 1924, the temperature dropped by 56 degrees in four hours from 53°F at noon time to -3°F at 4PM. On May 29, 1927, Georgetown and Silver Lakes received 30-40 inches of snow. Not only was that event notable for the amount of snow that fell, but also for its occurrence in late May. During June 1949, the East Anaconda weather station measured 13.00 inches of snow.

SHELDUS⁴⁸, a county level hazard database strongly encouraged by FEMA and its evaluators to be used in this plan, came up with many winter weather events for Deer Lodge County. Upon further inspection of the original data, the listings were determined to be inaccurate for the area and incorrectly listed for Deer Lodge County.

Probability

The probability of winter storms each season is almost a certainty. The probability of an event that overwhelms the community capabilities, though, is harder to determine. To date, Deer Lodge County has not had any winter weather events that have lead to a Presidential Disaster Declaration, but such an event is certainly possible. Those Presidential Disaster Declarations for winter weather that have occurred in nearby communities have been from late season storms. Heavy snow is not unheard of in June. After the trees have leafed out, the heavy snow is much more likely to bring down branches and power lines. The weather records for East Anaconda and Anaconda indicate that snow totals over 4 inches have occurred in June four times since 1905. Therefore, a significant winter weather event can

⁴⁸ Hazards Research Lab (2005). The Spatial Hazard Events and Losses Database for the United States, Version 3.1 [Online Database]. Columbia, SC: University of South Carolina. Available from <http://www.sheldus.org>

be expected in June once every 25 years. The probability of a damaging winter weather event throughout the rest of the winter will depend on the conditions such as if a utility outage occurs and the duration and intensity of the event. The probability for a major disaster from a winter weather event is considered moderate.

Mapping

Across the county, Deer Lodge County is vulnerable to winter weather. The higher elevations typically receive more snowfall, but all areas are prone to heavy snow and cold weather events. Therefore, the risk for winter weather and extended cold events is assumed to be the same countywide.

Associated Hazards and Other Factors

Winter storms and extended cold can be associated with many other hazards, and in particular, ground transportation accidents. The Interstate and other roadways can become hazardous very quickly during winter storms. Such incidents normally involve passenger vehicles, however, an incident involving a commercial vehicle transporting hazardous materials or a vulnerable population such as a school bus is also possible. Any hazard that causes a utility outage, such as an earthquake, during an extended cold period would present sheltering and cold weather exposure challenges. When combined with wind, blizzard conditions can quickly result. Firefighting efforts may also be more challenging during extreme cold temperatures as equipment freezes up. Heavy snow can alleviate drought conditions and improve forest health, thus decreasing the wildfire threat, but in doing so can often increase the probability of avalanches and riverine flooding come spring.

Vulnerability

Critical Facilities

All critical facilities are assumed to have the same vulnerability from winter storms and cold temperatures. Those facilities with back-up generators are better equipped to handle a winter storm situation should the power go out. The functionality of the critical facilities without generators in an extended cold period would be limited should the heating systems be disrupted. Critical facilities could also be inaccessible should intense snowfall overwhelm snow removal crews. Heavy snow loads could cause structural damage to critical facilities, but the probability of that is quite low. Shelters would be a primary concern, if opened, in a winter weather event.

Potential Losses

Snow in Deer Lodge County generally does not cause the communities to shut down or disrupt activities. Occasionally, though, extreme winter weather conditions can cause problems. The most common incidents in these conditions are motor vehicle accidents due to poor road conditions with most losses covered by automobile insurance. Losses to structures are usually minimal. Most structures are built to withstand heavy snow loads.

Potential Population Impacts

Since winter storms and cold spells typically do not cause major structural damage, the greatest threat to the population is the potential for utility failure during a cold spell. Although cold temperatures and snow are normal for Deer Lodge County, extremes can exist that would go beyond the capabilities of the community to handle. Should the temperatures drop below -15 for several weeks or several feet of snow fall in a short period of time, the magnitude of frozen water pipes or impassable streets could result in disastrous conditions for many people. If power lines were to fail due to snow/ice load, winds, or any other complicating factor, the situation would be compounded. In the event power or other utilities were disrupted, many homes could be without heat. With temperatures frequently dropping below zero in a typical winter, an event where heating systems failed could send many residents to shelters for protection. Other residents may try to heat their homes through alternative measures and increase the chance for structure fires or carbon monoxide poisoning.

Sheltering of community members would present significant logistical problems when maintained over a period of more than a day. Transportation, communication, energy (electric, natural gas, and vehicle fuels), shelter supplies, medical care, food availability and preparation, and sanitation issues all become exceedingly difficult to manage in extreme weather conditions. Local government resources could be quickly overwhelmed. Mutual aid and state aid might be hard to receive due to the regional impact of this kind of event.

Impact of Future Development

Future development should have little to no impact from winter storms and extended cold weather. The most significant challenge may be, as homes go up in more remote parts of the county, to access those residents should sheltering or emergency services be needed in an extreme event.

Data Limitations

Since major winter weather incidents occur infrequently, the biggest data limitation is in understanding the magnitude of a significant event and what the impacts that challenge local government may be. Since winter storms typically don't elevate to disaster declaration levels, county records outlining the number of car accidents, power outages, and contributing weather conditions would help evaluate the potential damages and frequency of such events. A more detailed study of the frequency of cold temperatures or a wind chill analysis would improve the data for an extended cold period assessment.

Risk Assessment Summary

The risk assessment for Deer Lodge County represents an approximate history and estimated vulnerabilities from the hazards identified. As with any assessment involving natural or man-made hazards, all potential events may not be represented here and an actual incident may occur in a vastly different way than described. This assessment, however, will be used to try to minimize damages from these events in the future.

Every type of event is different, ranging from population to property to economic impacts. Incidents also have different probabilities and magnitudes even within hazards. For example, a small earthquake will be different than a large earthquake and a moderate flood will be different from both of those. In an attempt to rate hazards and prioritize mitigation activities, a summary of the impacts from an event are presented in Table 4.66. Some hazards have estimates of dollar losses, whereas others are more qualitatively assessed based on available information from the risk assessment process. For more information on these determinations, see the individual hazard profiles.

Table 4.66 Hazard Ratings for Deer Lodge County, Montana

Hazard	Probability of Major Disaster	Property Impact	Population Impact	Economic Impact	Future Development Impact	Relative Overall Risk
Wildfire	High	High \$4.5M	Moderate	Moderate	High	<u>High</u>
Earthquake	Low	High \$3.9M	Moderate	High	Moderate	<u>High</u>
Flooding – Riverine and Flash	High	High \$2.5M	Moderate	High	Moderate	<u>High</u>
Communicable Disease and Bioterrorism	High	Low	High	High	Low	<u>Moderate</u>
Winter Storms and Extended Cold	Moderate	Low	High	Moderate	Low	<u>Moderate</u>
Hazardous Materials	Moderate	Low	Moderate	Moderate	Low	<u>Moderate</u>
Wind, Tornadoes, and Severe Thunderstorms	Moderate	Moderate	Moderate	Low	Moderate	<u>Moderate</u>
Drought	High	Low	Low	High	Low	<u>Moderate</u>
Flooding – Dam Failure	Low	Moderate	Moderate	Moderate	Low	<u>Moderate</u>
Terrorism and Civil Disorders	Low	Low	High	Moderate	Low	<u>Low</u>
Structure Fires	Low	Moderate	Low	Moderate	Low	<u>Low</u>
Aviation	Moderate	Low	Low	Low	Low	<u>Low</u>
Volcanic Ash	Low	Moderate	Moderate	Low	Low	<u>Low</u>
Avalanche	Low	Low	Low	Low	Low	<u>Low</u>
Landslide and Soil/Ground Failure	Low	Low	Low	Low	Low	<u>Low</u>

5. Mitigation Strategy

Hazard mitigation, as defined by the Disaster Mitigation Act of 2000, is any sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards. The development of a mitigation strategy allows the community to create a vision for preventing future disasters, establish a common set of mitigation goals, prioritize actions, and evaluate the success of such actions.

The Anaconda-Deer Lodge County Mitigation Strategy is based on the results of the risk assessment and recommendations by knowledgeable community members through Local Emergency Planning Committee and public meetings. The overarching mission of this mitigation strategy is to:

Reduce or prevent losses from disasters.

Rather than wait until a disaster occurs, Anaconda-Deer Lodge County has developed this strategy to move in a proactive direction in disaster prevention. All losses cannot be entirely mitigated, however, some actions can be taken, as funding and opportunities arise, that may reduce the impacts of disasters and eventually save taxpayers' money. The mitigation actions were developed based on direct input from the community and prioritized through a multi-step process.

Goals, Objectives, and Proposed Actions

Goal 1: Prevent community losses from wildfires and structure fires.

Objective 1.1: Minimize the risk to structures in the wildland/urban interface.

- Encourage homeowners to reduce fuels around structures and create a fire defensible space.
- Adopt the Uniform Fire Code for the wildland/urban interface areas.
- Revise subdivision regulations with a better focus on defensible space/maintenance requirements in the wildland/urban interface.

Objective 1.2: Improve wildland firefighting capabilities.

- Develop dry hydrant water supplies in wildland/urban interface areas.

Objective 1.3: Reduce the possibility of large urban structure fires.

- Upgrade hydrants in the east end of Anaconda.
- Promote sprinkler installations in older commercial structures.

Goal 2: Reduce potential losses from earthquakes.

Objective 2.1: Prevent earthquake damages to critical facilities, infrastructure, and facilities housing vulnerable populations.

- Tie down/secure objects in schools that could fall during an earthquake.
- Seismically stabilize large glass panes in Dwyer Primary School and Anaconda High School.
- Conduct earthquake drills in the schools.
- Retrofit critical government facilities for earthquakes.
- Inspect key bridges for seismic stability.

Objective 2.2: Prevent residential and commercial losses from earthquakes.

- Educate home and business owners on simple earthquake retrofits.
- Survey commercial structures for earthquake stability and recommend retrofits.

Goal 3: Reduce future damages from flooding.

Objective 3.1: Prevent flood losses to Anaconda-Deer Lodge infrastructure.

- Relocate and upgrade culverts on Morrel Road from the Old Opportunity landfill to Gas City Road (approximately 4 miles of roadway).
- Install culverts and raise roadbed on North Fork Road off the Big Hole Highway from Bacon's Home Ranch to the county line.
- Replace bridge in Galen.
- Upgrade and maintain storm drains from Fourth Street to the smelter.
- Install storm drains in areas where they are lacking in the west end of Anaconda.
- Mitigate damages to critical facilities in the 100-year floodplain.
- Prevent flood contamination of well houses serving the Anaconda public water system.
- Install backflow prevention systems from the Anaconda waste water facility.

Objective 3.2: Reduce losses to private property from flooding.

- Educate the public on flood insurance.
- Clear debris from around old bridges
- Implement security measures at the dams.

Goal 4: Reduce potential losses from winter storms and extended cold.

Objective 4.1: Protect vulnerable populations from utility outages during winter storms and extended cold periods.

- Install generators at elder care facilities.
- Develop a sheltering plan specifically for utility outages.

Goal 5: Minimize community exposure to hazardous material releases.

Objective 5.1: Reduce the risk to the Montana State Hospital from hazardous material releases.

- Establish a back emergency exit from Montana State Hospital.

Objective 5.2: Harden hazardous material infrastructure.

- Protect the exposed natural gas lines near Warm Springs.

Goal 6: Reduce community risk from communicable disease.

Objective 6.1: Slow the spread of communicable disease.

- Create a public education communicable disease prevention program.

Goal 7: Optimize the use of all-hazard mitigation measures.

Objective 7.1: Maintain continuity of government services in a disaster.

- Install generators to maintain water services and waste water treatment.
- Designate a location for the Anaconda-Deer Lodge Emergency Operations Center.

Objective 7.2: Develop resources that can be used to further study and prepare for all hazards.

- Develop GIS data that can be used with FEMA's HAZUS loss estimated models.
- Become a National Weather Service Storm Ready County.
- Train Anaconda-Deer Lodge County Department Heads and engineers in hazard mitigation.

Objective 7.3: Utilize low cost all-hazard warning systems.

- Put NOAA Weather Radios in critical facilities and schools.

Action Prioritization

Each of the proposed projects has value, however, time and financial constraints do not permit all of the proposed actions be implemented immediately. By prioritizing the actions, the most critical, cost effective projects can be achieved in the short term. The prioritization of the projects serves as a guide for choosing and funding projects, however, depending on the funding sources, some actions may be best achieved outside the priorities established here.

To ensure that community goals and other factors are taken into account when prioritizing projects, a prioritization model that uses the following factors has been developed: cost (including management costs), feasibility (politically, socially, and environmentally), population benefit, property benefit, and hazard rating.

Each of the factors was ranked low, moderate, or high for each of the projects. The methods used to assign a category and the associated score can be generally defined as follows:

<u>Cost:</u> (including management)	3 Score	<i>Low: < \$10,000</i>
	2 Score	<i>Moderate: \$10,000-\$50,000</i>
	1 Score	<i>High: >\$50,000</i>
<u>Feasibility:</u> (politically, socially, environmentally)	1 Score	<i>Low</i>
	2 Score	<i>Moderate</i>
	3 Score	<i>High</i>
<u>Population Benefit:</u>	1 Score	<i>Low: < 25% of population to benefit</i>
	2 Score	<i>Moderate: 25%-75% of population to benefit</i>
	3 Score	<i>High: > 75% of population to benefit</i>
<u>Property Benefit:</u>	1 Score	<i>Low: < 25% of property to benefit</i>
	2 Score	<i>Moderate: 25%-75% of property to benefit</i>
	3 Score	<i>High: > 75% of property to benefit</i>
<u>Hazard Rating:</u> (from risk assessment summary)	1 Score	<i>Low</i>
	2 Score	<i>Moderate</i>
	3 Score	<i>High</i>

A summary of the scores for each of the proposed projects can be found in Table 5.1.

Table 5.1 Proposed Actions and Priority Scores for Deer Lodge County

Goal 1: Prevent community losses from wildfires and structure fires.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Rating</i>	<i>Score</i>
Homeowner fuels reduction	Moderate	Moderate	Moderate	Moderate	High	11
WUI Uniform Fire Code	Low	Moderate	Moderate	Moderate	High	12
WUI Subdivision Regulations	Low	Moderate	Moderate	Moderate	High	12
Georgetown Lake dry hydrants	High	Moderate	Moderate	Moderate	High	10
East Anaconda hydrants	High	High	Moderate	Moderate	Low	9
Commercial sprinklers	Moderate	Moderate	Moderate	Moderate	Low	9
Goal 2: Reduce potential losses from earthquakes.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Ratings</i>	<i>Score</i>
School seismic tie downs	Low	High	Moderate	Low	High	12
School glass pane stabilization	Moderate	High	Moderate	Low	High	11
School earthquake drills	Low	High	Moderate	Low	High	12
Critical facilities earthquake retrofit	Moderate	High	Moderate	Low	High	11
Bridge seismic study	Moderate	High	Moderate	Moderate	High	12
Home and business seismic retrofit education	Low	Moderate	Moderate	Moderate	High	12
Commercial seismic survey	Moderate	Moderate	Moderate	Moderate	High	11
Goal 3: Reduce future damages from flooding.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Ratings</i>	<i>Score</i>
Morrell Road relocation and culverts	High \$1.2M	Moderate	Moderate	Moderate	High	10
North Fork Road culverts	High \$100-200K	Moderate	Moderate	Moderate	High	10
Galen Bridge replacement	High \$100K	Moderate	Moderate	Moderate	High	10
Fourth Street storm drains	High	Moderate	Moderate	Moderate	High	10
West Anaconda storm drains	High	Moderate	Moderate	Moderate	High	10
Critical facilities flood mitigation	Moderate	Moderate	Moderate	Moderate	High	11
Well houses flood mitigation	High	High	High	Low	High	11
Waste water facility backflow prevention	High	Moderate	High	High	High	12
Flood insurance education	Low	Moderate	Moderate	Moderate	High	12
Bridge debris removal	Moderate	High	Moderate	Moderate	High	12
Dam security	Moderate	Moderate	Moderate	Moderate	Moderate	10

Table 5.1 (continued) Proposed Actions and Priority Scores for Deer Lodge County

Goal 4: Reduce potential losses from winter storms and extended cold.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Ratings</i>	<i>Score</i>
Elder care generators	High	High	Moderate	Low	Moderate	9
Utility outage shelter plan	Low	High	Moderate	Low	Moderate	11
Goal 5: Minimize community exposure to hazardous material releases.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Ratings</i>	<i>Score</i>
Montana State Hospital evacuation exit	Moderate	Moderate	Moderate	Low	Moderate	9
Warm Springs natural gas line protection	High	Moderate	Moderate	Moderate	Moderate	9
Goal 6: Reduce community risk from communicable disease.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Ratings</i>	<i>Score</i>
Communicable disease education	Low	Moderate	Moderate	Low	Moderate	10
Goal 7: Optimize the use of all-hazard mitigation measures.						
<i>Project</i>	<i>Cost</i>	<i>Feasibility</i>	<i>Population Benefit</i>	<i>Property Benefit</i>	<i>Hazard Ratings</i>	<i>Score</i>
Water system generators	High	High	High	Moderate	Moderate	11
EOC designation	Low	High	Moderate	Moderate	Moderate	12
HAZUS GIS data development	Moderate	High	Moderate	Moderate	High	12
NWS Storm Ready	Low	Moderate	Moderate	Low	Moderate	10
Department head mitigation training	Low	High	Moderate	Moderate	Moderate	12
NOAA Weather Radios in critical facilities and schools	Low	High	Moderate	Low	Moderate	11

Implementation Plan

Those actions that have received the highest scores will be given the highest priority. As funding or opportunities to initiate these projects come up, the higher priority activities can be prioritized even further with more detailed costs, benefits, and other criteria. The implementation strategy for some of the proposed actions can be found in Table 5.2.

Table 5.2 Implementation Plan for Actions in Deer Lodge County

Project Description	Responsible Agency	Potential Funding Source(s)	Priority Score
Adopt the Uniform Fire Code for the wildland/urban interface areas.	Planning Department Fire Departments	Internal	12
Revise subdivision regulations with a better focus on defensible space/maintenance requirements in the wildland/urban interface.	Planning Department Fire Departments DNRC	Internal	12
Tie down/secure objects in schools that could fall during an earthquake.	School Districts	Internal FEMA	12
Conduct earthquake drills in the schools.	School Districts	Internal	12
Inspect key bridges for seismic stability.	Road Department Montana DOT	Internal FEMA Montana DOT	12
Educate home and business owners on simple earthquake retrofits.	DES Red Cross Building Inspector	Internal FEMA Red Cross	12
Install backflow prevention systems from the Anaconda waste water facility.	Public Works Public Health	FEMA EPA Internal	12
Educate the public on flood insurance.	DES Floodplain Manager Insurance Agents	FEMA Internal	12
Clear debris from around old bridges.	Road Department	FEMA Internal	12
Designate a location for the Anaconda-Deer Lodge Emergency Operations Center.	Commissioners DES	Internal	12
Develop GIS data that can be used with FEMA's HAZUS loss estimated models.	Commissioners Planning Department	FEMA Internal	12
Train Anaconda-Deer Lodge County Department Heads and engineers in hazard mitigation.	Commissioners Department Heads Engineers	FEMA Internal	12
Encourage homeowners to reduce fuels around structures and create a fire defensible space.	Fire Departments DNRC	USFS Firewise DNRC Private	11
Seismically stabilize large glass panes in Dwyer Primary School and Anaconda High School.	School Districts	FEMA Internal	11
Retrofit critical government facilities for earthquakes.	Commissioners DES Facility Supervisors	FEMA Internal	11
Survey commercial structures for earthquake stability and recommend retrofits.	DES Chamber of Commerce	FEMA Private	11
Mitigate damages to critical facilities in the 100-year floodplain.	Commissioners DES Facility Supervisors	FEMA Internal	11

Table 5.2 (continued) Implementation Plan for Actions in Deer Lodge County

Project Description	Responsible Agency	Potential Funding Source(s)	Priority Score
Prevent flood contamination of well houses serving the Anaconda public water system.	Public Works	FEMA Internal	11
Develop a sheltering plan specifically for utility outages.	Red Cross	Internal	11
Install generators to maintain water services and waste water treatment.	Public Works	FEMA Internal	11
Put NOAA Weather Radios in critical facilities and schools.	DES School Districts	NWS FEMA Internal	11
Develop dry hydrant water supplies in the Georgetown Lake area.	Fire Departments Homeowners and Associations	Private	10
Relocate and upgrade culverts on Morrel Road from the Old Opportunity landfill to Gas City Road (approximately 4 miles of roadway).	Road Department	FEMA Internal	10
Install culverts and raise roadbed on North Fork Road off the Big Hole Highway from Bacon's Home Ranch to the county line.	Road Department	FEMA Internal	10
Replace bridge in Galen.	Road Department	FEMA Internal	10
Upgrade and maintain storm drains from Fourth Street to the smelter.	Road Department Public Works	FEMA Internal	10
Install storm drains in areas where they are lacking in the west end of Anaconda.	Road Department Public Works	FEMA Internal	10
Implement security measures at the dams.	DES DNRC	Homeland Security DNRC Internal	10
Create a public education communicable disease prevention program.	Public Health Hospital	DPHHS Private Internal	10
Become a National Weather Service Storm Ready County.	DES NWS	NWS Internal	10
Upgrade hydrants in the east end of Anaconda.	Public Works Anaconda Fire Department	Internal	9
Promote sprinkler installations in older commercial structures.	Fire Departments Chamber of Commerce	Private	9
Install generators at elder care facilities.	Elder Care Facility Managers Public Health	Private	9
Establish a back emergency exit from Montana State Hospital.	Montana State Hospital USFS - Anaconda Job Corps	Montana State Hospital USFS	9
Protect the exposed natural gas lines near Warm Springs.	DES Northwestern Energy	Private	9

Enabling Legislation

The enabling legislation for the implementation of this plan specifically comes from Section 322, Mitigation Planning, of the Robert T. Stafford Disaster Relief and Emergency Assistance Act, enacted by Section 104 of the Disaster Mitigation Act of 2000 (P.L. 106-390). The Interim Final Rule for this legislation was published in the Federal Register on February 26, 2002 at 44 CFR Part 201. Other legislation, orders, and plans that support the initiatives presented in this plan include:

- Presidential Executive Order 12898, Environmental Justice
- Presidential Executive Order 11988, Floodplain Management
- Presidential Executive Order 11990, Protection of Wetlands
- Montana Code Annotated, Title 10, Chapter 3, Disaster and Emergency Services
- Montana Code Annotated, Title 76, Chapter 5, Flood Plain and Floodway Management
- Montana Code Annotated, Title 50, Chapter 60, Building Construction Standards
- Montana Code Annotated, Title 76, Chapter 2, Planning and Zoning
- Anaconda-Deer Lodge County Floodplain Ordinance 106
- Anaconda-Deer Lodge County Development Permit System
- Anaconda-Deer Lodge County Subdivision Regulations
- Anaconda-Deer Lodge County Capital Improvements Plan

Existing Programs

The approval of this plan shows that hazard mitigation is an important priority in Anaconda-Deer Lodge County. As a priority, the information contained in this plan will be used in current and future planning initiatives. Anaconda-Deer Lodge County is currently developing a Growth Policy. The hazard information and recommendations presented in this plan will be considered when further developing this Growth Policy and when other plans are created or updated.

The Local Emergency Planning Committee is already active in the promotion of hazard mitigation and will continue to do so with the member agencies represented. Additional support will be encouraged through the Anaconda-Deer Lodge County Planning Department through building and development requirements.

6. Plan Maintenance Procedures

Plan Monitoring, Evaluation, and Updates

This plan is maintained by the Anaconda-Deer Lodge County LEPC. This committee has representatives from many departments, state agencies, and private entities. All were active in the development of this plan. Annually at the May LEPC meeting, a public meeting will be held to review the plan. Notices will be posted in The Anaconda Leader newspaper. Annual updates should be made and committee approval may then take place at the June meeting or subsequent meetings. As hazard information is added or updated, events occur, and projects are completed, the plan will be updated. Each year, a notice of approval will be sent to Montana Disaster & Emergency Services by the Anaconda-Deer Lodge LEPC Chairperson, and if major changes take place, a revised version of the plan will also be submitted. Every five years, the plan will be submitted to Montana Disaster & Emergency Services and the Federal Emergency Management Agency Regional Office for their approval. The next formal submission will occur in June 2010. Table 6.1 outlines the update schedule for the plan.

Table 6.1 Deer Lodge County Schedule of Updates

Plan Section	Post-Disaster	Annually	Every 5 Years
Annual Report to Montana DES		X	X
Adoption Documentation	X	X	X
Introduction			X
Planning Process	X	X	X
Hazard Identification	X		X
Critical Facilities			X
Non-Critical Government Facilities			X
Buildings			X
Population			X
Infrastructure			X
Economy			X
Land Use and Future Development			X
Vulnerability Assessment Methodology			X
Hazard Profiles	X	X	X
Risk Assessment Summary			X
Goals, Objectives, and Proposed Actions	X	X	X
Action Prioritization	X	X	X
Implementation Plan	X	X	X
Plan Maintenance Procedures			X

Public Involvement

An important aspect of this plan since its inception has been public involvement. To encourage continued participation, comments can be directed to the Anaconda-Deer Lodge LEPC Chairperson. This committee can be reached through Disaster & Emergency Services at:

Anaconda-Deer Lodge Disaster & Emergency Services
Anaconda-Deer Lodge Courthouse
800 Main Street
Anaconda, MT 59711

Comments will be considered during the annual review of this plan. The public is also encouraged to attend the annual plan review meeting. If needed, a special LEPC subcommittee will be developed to hold public meetings and coordinate plan changes and comments.

Appendix A

Public Meeting Documentation

Appendix B

Meeting Attendance Records

Appendix C

References/Footnotes

References/Footnotes

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Appendix D

Acronyms

Acronyms

BNSF – Burlington Northern Santa Fe
CAMA – Computer Assisted Mass Appraisal
CERCLIS – Comprehensive Environmental Response, Compensation, and Liability Information System
CFR – Code of Federal Regulations
DES – Disaster and Emergency Services
DNRC – Department of Natural Resources and Conservation
DOT – Department of Transportation
DPHHS – Department of Public Health and Human Services
EOP – Emergency Operations Plan
EPA – Environmental Protection Agency
FAA – Federal Aviation Administration
FBI – Federal Bureau of Investigation
FEMA – Federal Emergency Management Agency
FIRM – Flood Insurance Rate Map
FIS – Flood Insurance Study
GIS – Geographic Information System
HAZUS-MH – Hazards US Multi-Hazard
LEPC – Local Emergency Planning Committee
MBMG – Montana Bureau of Mines and Geology
MMIA – Montana Municipal Insurance Authority
NFIP – National Flood Insurance Program
NID – National Inventory of Dams
NOAA – National Oceanic and Atmospheric Administration
NPX – National Public Entity Excess Program
NTSB – National Transportation & Safety Board
NWS – National Weather Service
PCA – Personal Care Assistant
PGA – Peak Ground Acceleration
RYO – Reintegrating Youthful Offenders
SARA – Superfund Amendments and Reauthorization Act
SFHA – Special Flood Hazard Area
TIGER – Topologically Integrated Geographic Encoding and Referencing System
USACE – United States Army Corps of Engineers
USDA – United States Department of Agriculture
USGS – United States Geological Survey
USFS – United States Forest Service
WUI – Wildland/Urban Interface

Appendix E

**Crosswalk Reference
Document**

Appendix F

FEMA/State Approval Letter